1. Introduction

This review literature outlines the key ideas in the pro-poor growth debate as they impact on irrigation schemes.

The most important finding in the literature is the unanimity on the need to have a site specific focus to irrigation schemes and to ensure that the community is brought into process from the start, with their priorities, in order to equip them and their elected committee to manage the scheme once the department, or agency or donor withdraws form the process. In word there must be revitalization which “implies a move away from pure infrastructure rehabilitation to a comprehensive programme to structure, train and capacitate the smallholder farmers to run their scheme profitably and sustainably” (de Lange, 2004).

The literature supports rehabilitation in the strongest terms warning of failure if capacity building of the community is left out:

“The experience from the review is explicitly clear that infrastructure development alone or as a dominant part of the intervention is destined to failure. Farmers in smallholder schemes need support systems that go far beyond just the irrigation system if they are to improve their livelihoods significantly. Irrigation is a highly complex mix of social, agriculture, market and technical parameters, which are in a state of on-going flux and interconnectedness. Irrigation planners and advisors must, as a critical priority, embrace the multiple sectoral interests and dynamics in planning thinking. Narrow isolated, engineering and infrastructure driven programs are destined to fail in their objectives” (emphasis in original) (Dension and Manona, 2007: 5-29).
Merry et al (2003) notes that integrated water resource management policies on their own cannot improve the livelihoods of people. The narrow focus of “water resources” needs to be replaced by a holistic view of “natural resources” as it is all the natural resources not only water which are used by the poor.

“Integration will be the key in this new approach: integration across scales, components, stakeholders and disciplines” (Sayer and Campbell in Merry et al, 2003).

“Smallholder irrigation is a highly case-specific, potentially complex, dynamic socio-biophysical entity influenced by a considerable number of internal characteristics and external driving forces and factors, and is a driver of considerable change on downstream sectors and users. Have we recognised this special nature of irrigation within livelihoods, food and cash production, river basins and the environment?” (Lankford, 2001).

“Focusing more emphasis on the improvement of physical infrastructure is not sufficient. There is a need for a more comprehensive approach, encompassing the development of both physical capital as well as social capital that provide complex systems… to use irrigation water” (Neeraj et al, 1998).

IMT (and in this case the intervention process in general) must hold out the promise of significant net improvement in life situations for a significant proportion of members and the irrigation system must be the central resource to creating an improvement in farmers’ life situation (Shah et al, 2002).

“Access to reliable water is an essential, though not sufficient condition for sustainable improvement in irrigated agriculture…the productive use (of water) depends on irrigation technology but will only be successful when market development and information supply to farmers are made a core priority in the overall intervention design” (emphasis in original) (Dension and Manona, 2007: 5-30).
1.1. Outline of Review

The outline of the review is as follows:

Section 2  Global Overview: Policies, Strategies and Guidelines of Pro-Poor Growth

Poverty reduction must be increased through increasing the rate of income growth of the poor. “On average, growth has been much more of a lifesaver to the poor than redistribution.” The World Bank’s report (2005) on Pro-Growth in the 1990’s begins the executive summary with this following advice, “Policymakers who seek to accelerate growth in the incomes of poor people, and thus reduce overall poverty, would be well advised to implement policies that enable their countries to achieve in a higher rate of overall growth.”

A series of pro-poor guidelines were produced from the literature to highlight core elements.

Section 3  Globalization and the LED Conversation

Globalization has created a new world in terms of new opportunities and constraints for nations, regions and cities all over the world. With this change in the real conditions of people in the world there has been a concomitant shift from traditional development theories to local economic development (ILO, 2007). The LED strategies are more holistic and comprehensive than the previous development strategies.

Section 4  Economic Growth and Infrastructure: Pro-poor Growth and Infrastructure

Development literature has understood infrastructure investments as a significant, if not dominant factor, of economic growth. Theoretically, infrastructure is seen to work as a driver of economic growth through capital accumulation (directly) and through total factor productivity gains, i.e., gains in each factor of productivity such as labour or capital (indirectly). Economists argue that infrastructure
facilitates private investment by lowering production costs and opening new markets.

Section 5  Rural Economic and Enterprise Development and Pro-Poor Growth
The Guide to Rural Economic and Enterprise Development (REED) (2003) operates within the context of poverty reduction through economic growth, i.e., pro-poor growth. “REED views entrepreneurs and the private sector as the main drivers of sustainable rural development, and emphasises the importance of providing an enabling environment for market-oriented economic activities” (REED: 2003, 1).

Section 6  Infrastructure and Pro-Poor Growth
A DAC document Promoting Pro-Poor Growth: Policy Guidance for Donors (2006) states “Reliable, efficient infrastructure is crucial to economic and social development that promotes pro-poor growth. By raising labour productivity and lowering production and transaction cost, economic infrastructure – transport, energy, information and communication technology, and drinking water, sanitation and irrigation – enhances economic activity and so contributes to growth, which is essential for poverty reduction.”

Section 6.1 Green Revolution
Section 6.2 Analytical Framework: An Introduction to Understanding Infrastructure Impact
Section 6.3 Economic Data Demonstrating a Connection between Infrastructure and Poverty Reduction
Economic studies demonstrate that rural infrastructure investments lead to poverty reduction by raising mean income and consumption thorough higher agriculture and non-farm productivity which stimulates employment and income opportunities leading to an increase of wage goods.

Section 6.3.1  Irrigation impact on poverty reduction
Section 6.3.2  Roads impact on poverty reduction
Section 6.3.3 Electricity impact on poverty reduction

Based on the above discussions it is evident from the econometric literature on infrastructure that irrigation and roads have a significant the direct and indirect impacts on poverty reduction. It is clear that education also plays a role in increasing incomes.

Section 6.4 The Multiplier Effect: Measuring Socioeconomic Impacts - the Positive Externality Effects - of Irrigation

Section 6.5 Expanding the Lessons from the Green Revolution: Reduction of government failure and market failures in the management of irrigation schemes

The Global Initiative for Smallholder Irrigation is a poverty reduction plan which targets 2 million rural poor households on 1 million hectares a year over 15 years to participate in pro-poor growth irrigation schemes.

Section 7 Case Studies: Asia

Section 7.1 Macro Level Analyses in India

Section 7.2 Case Study: Gujarat, India

Section 7.3 Case Study: Uda Walawe Left Bank Irrigation System, Sri Lanka

Section 7.4 Case Study: Mandi Bahauddin and Gujrat, Pakistan

Section 7.5 Case Study: Bangladesh, China (PRC), India, Indonesia, Pakistan and Viet Nam

Section 7.6 Evidence from 14 Countries: Bangladesh, Bolivia, Brazil, Burkina Faso, el Salvador, Ghana, India, Indonesia, Romania, Senegal, Tunisia, Uganda, Vietnam, and Zambia

Section 8 Overview of Infrastructure and Pro-Poor Growth in Sub-Saharan Africa

In 2003/4, at the mid-point in the 25 years of the Millennium Declaration (1990-2015) only six counties were on target for achieving the first goal of halving the proportion of people living below $1 per day. Interestingly none of these six countries (Algeria, Egypt, Libya, Morocco, Tunisia and Mauritius) are sub-Saharan countries.
Section 8.1 Privatized Infrastructure Linkages with Pro-Poor Growth
Section 8.2 Private Participation in Infrastructure in Africa
Section 8.3 Impact of Private Participation in Infrastructure in Africa

Section 9  Case Studies: Africa
Section 9.1 Irrigation Reform in Malawi: Domasi and Likangala Irrigation Schemes
Section 9.2 Revitalization in Irrigated Agriculture Projects – Kenya and Ethiopia

Section 10 RESIS

The Limpopo Revitalisation of Small Irrigation Schemes (RESIS) evolved from the Limpopo Water Care programme and it is fundamentally the fourth phase of the programme. With the integration of the RESIS programme in 2005, into the Limpopo Provincial under the new department head and MEC the RESIS Recharge programme was introduced to meet more rapid delivery.

Section 10.1 WaterCare Programmes
Section 10.1.1 Northern Province Irrigation Scheme Project (Water Care Pilot Programme) involved three pilot projects: Timeframe 1998 – 2001;
Section 10.1.2 WaterCare Programme – Mega Plan II and III involved six clusters of 24 schemes: Timeframe 2002 – 2004;
Section 10.1.3 Revitalisation Programme of Small Irrigation Schemes (RESIS) involving 126 schemes: Timeframe 2003 – 2010;
Section 10.1.4 RESIS Recharged involving the same schemes: Timeframe 2005 – 2010.

Section 11 Future Scenarios for RESIS

From the review of the literature one can state categorically that the current RESIS strategy in its RESIS Recharge phase is on the path of failure. The RESIS Recharge phase by its prime focus on investments in large scale infrastructure and a concomitant disregard for the human capital elements of the revitalization strategy means in fact that the programme has become one of rehabilitation and expansion of infrastructure.

Section 11.1A Simple Scenario for RESIS Recharge
Section 11.2 Towards Revitalizing the Revitalization Components of the RESIS Programme

Section 11.3 Revitalization within a Pro-Poor Growth Strategy

Section 12 Conclusions

Section 12.1 Framing Development: Towards a Developmental State which Focuses on Pro-Poor Growth

Section 12.2 Conclusion: Research Issues on Pro-Poor Growth on Revitalized Irrigation Schemes
2. Global Overview: Policies, Strategies and Guidelines of Pro-Poor Growth

“The operationalizing Pro-Poor Growth (OPPG) program was initiated in 2003 by AFD, BMZ, KFw/GtZ, DFID and the World Bank to better understand the options for policymakers to increase the impact of growth on poverty reduction and how they vary depending on policies and country conditions” (World Bank, 2005: 8).

Many people, numbering in billions, are excluded from the basic needs for nutrition, health, education, housing and sanitation (UNDP 2006). The World Bank (2005) has questioned the definition of pro-poor growth as growth that leads to significant reductions in poverty. Great clarity of definition with more specifics is required if programmes are to be created to reduce poverty – what precisely are they aimed at?

From the literature two broad definitions of pro-poor growth can be identified: The first definition maintains that pro-poor growth exists when the income portion of the poor increases. From this it follows that inequality must fall for pro-poor growth to exist (White and Anderson 2001; Kakwani and Pernia 2000). The second definition maintains that the rate of poverty reduction must be increased through increasing the rate of income growth of the poor (Dollar and Kraay 2000; Ravallion and Chen 2003; Ravallion 2004; and DFID 2004). The former definition, as a policy tool guiding the implementation of programmes, has the potential to reduce poverty but slow down growth because it is possible to reduce de facto poverty faster with growth even though the portion of the poor decreases. Thus the international community has accepted the second definition. DFID (2004a) in its Pro-Growth Briefing also affirmed that pro-poor growth strategies should focus on general economic growth if it is to impact on the incomes of the poor. And in another report DFID (2004b) argues that low-income countries which have experienced low growth need to achieve higher rate of economic growth to deal with poverty. Easterly (2002) arguing in terms of economic growth states, “On average, growth has been much more of a lifesaver to the poor than redistribution.” Davis (2006) argues that to link both “pro-poor growth and
development strategy with economic growth through equality is an important condition to ensure sustainable social and political development. The evidence suggests that growth plays a central role in raising living standards.”

According to Hadingham (2007) LED development in South Africa has not resolved the tension between the different approaches between pro-poor and pro-growth: “The development of LED in South Africa has also been characterised by a battle for the soul of LED by pro-poor and pro-growth factions....Pro-poor approaches tend to focus on enabling communities and individual households to secure and enhance their livelihoods. The pro-growth approach tends to be non-developmental in terms of its focus…” The arguments developed here around the issue of pro-poor growth resolves these theoretical differences dissolving the separation between pro-poor and pro-growth into this new concept. Pro-poor growth sets up a framework to harmonize economic growth with poverty reduction and for outlining policy and practical steps to promote pro-poor growth so that the economy grows and alleviates poverty simultaneously.

Amartva Sen offers a holistic view of human development arguing that such development is substantially more than economic growth though without basic economic development opportunities in life to realize human potentiality are inaccessible. This conception of human development underscores the very rationale for poverty alleviation and the implied moral, political and economic reasons and benefits to pursue such poverty alleviation. Amartva Sen conceptualises pro-poor growth in human development terms and outlines the broad scope of development as follows:

“Human development is about much more than the rise or fall of national incomes. It is about creating an environment in which people can develop their full potential and lead productive, creative lives in accord with their needs and interests. People are the real wealth of nations.

“Development is thus about expanding the choices people have to lead lives that they value. And it is thus about much more than economic growth, which is only a means if a very important one of enlarging people’s choices. Fundamental to enlarging these
choices is building human capabilities - the range of things that people can do or be in life.

“The most basic capabilities for human development are to lead long and healthy lives, to be knowledgeable, to have access to resources needed for a decent standard of living and to be able to participate in the life of the community. Without these, many choices are simply not available, and many opportunities in life remain inaccessible.” Amartva Sen (in UNDP 2006)

Since 1999, the South African economy has grown continuously indeed the strong economic growth also resulted in the rise of income for the poorest. “However, the rate of improvement of income for the poor has not matched that of the rich, and thus while income poverty is declining the inequality has not been reduced” (Piters, 2007: 5). During the period since 1994 the income inequalities in South Africa have steadily increased (measured by the Gini Coefficient). Over this period in contrast the inequality between races has declined yet the inequality within race groups has grown (measured by the Theil index). A Adelzadeh (2007) analysing the skewed development taking place in South Africa argues that if pro-poor development is to be effective “both reductions in income inequality and high growth rates are necessary prerequisites for an accelerated poverty reduction path; …the labour market needs to be pro-poor in terms of employment allocation and income; and the social security system needs to be substantially expanded.”

According to Piters pro-poor growth can be framed as follows, “Pro-poor growth is a strategic approach whereby economic growth is specifically used to reduce poverty. The primary target group of pro-poor growth projects is the (extremely) poor and disadvantaged people who can be integrated into the growth process by enabling them to engage in productive employment and entrepreneurial activities.” (2007:6). A fundamental factor in pro-poor growth is that as many people as possible have productive employment. Development obstacles which hamper the opportunities of the poor must be addressed. Bureaucratic red tape which creates an administrative barrier and over regulated environment must be removed.
2.1. Policy Interventions to Stimulate Pro-Poor Growth including Agricultural Infrastructure

A number of policy studies, based on an in-depth range of empirical studies, have identified the nature of pro-poor growth have been untaken by such key global players as the World Bank,

2.1.1. World Bank Pro-Poor Growth Policy Guidelines

The World Bank (2005) report on Pro-poor growth in the 90s is an inclusive and thorough cross-country study of 14 countries. The countries studied are Bangladesh, Bolivia, Brazil, Burkina Faso, el Salvador, Ghana, India, Indonesia, Romania, Senegal, Uganda, Vietnam, and Zambia. The comparative study analysed investigations in each of the 14 countries on how economic development impacted on poverty, growth and inequality. The following four policy areas were identified as having affected the participation of the poor in growth:

- The macro framework and the composition of growth;
- Agriculture and non-farm income;
- Labour markets and employment; and
- Public expenditure policy.

The issues of gender and institutions were discussed in each area. In addition some of the country studies referred to financial markets, health services, and voice and empowerment issues.

The evidence assembled from this comparative study confirmed Ravallion’s conception of pro-poor growth (the second definition of pro-poor growth above) that the pace of the overall economic growth is the main determinant in the eradication or decline of poverty. Based on these empirical findings a pro-poor growth policy and
implementation programme should have the following elements (World Bank, 2005: 12):

- Macro-economic stability;
- Well-defined property rights;
- Good investment climate;
- Attractive incentive framework;
- Well-functioning factor markets;
- Broad access to infrastructure;
- Broad access to education.

This comprehensive list in fact is an identification of all the components of successful economic growth, which is precisely the point of Ravallion (2004). The study found that though economic growth was a fundamental prerequisite in the decline of poverty greater poverty reduction was achieved where policies were in place in order to facilitate the economic participation of the poor.

The study underscored what is common knowledge to a developer that the overwhelming majority of the world’s poor people live in rural areas and it identified five policy interventions in agriculture:

- Improving market access and lowering transaction costs:
  Small farmers in the sub-Saharan African sample of the study (Uganda, Burkina Faso, Zambia and Ghana) faced limited market access and expensive transaction costs both of which curtailed their income from agricultural produce.

- Strengthening property rights for land:
  The lack of access to land in terms of land tenure policies and land markets limited the opportunities of small farmers in the sub-Saharan African sample to invest in land. In sub-Saharan Africa women face additional challenges as they lack legal sanction for access to property especially for inheritance.

- Creating an incentive framework that benefits all farmer:
Smallholders in Vietnam emerged as a world exporter of rice and coffee in the 1990’s because of trade incentives and trade liberalization (i.e., the withdrawal of the state’s control over the economy). In contrast, in Africa the same policies failed as a vacuum was created once the state withdrew as the private sector was unable to rise to meet the new opportunities.

- Expanding the technology available to smallholder producers:
  The Green Revolution in Asia, leading to a surge in smallholder production, was driven to a large extent by increasing the smallholder’s access to technology. In contrast, in sub-Saharan Africa there has been a lack of technologies for the more arid climates and this has hampered pro-poor economic growth.

- Helping poorer and smaller producers deal with risk:
  Countries which developed the above four factors managed the risk factor of the smallholder better than those which had inadequate policies or implementation strategies.

2.1.2. OECD Pro-Poor Growth Policy Guidelines

In contrast an OECD report (2005) identified the following elements as fundamental initiators of economic development strategies – so fundamental that they need to be factors in policy. The focus here is more empowering the individual and the community than aligning macro-economic policy and technological inputs:

- Innovation
- Skills
- Entrepreneurship
- Social cohesion

2.1.3. DAC Pro-Poor Growth Policy Guidelines

Three key policy guidelines for poverty reduction were derived from research undertaken by DAC (2001). These policy guidelines can be summarized as follows:
Policy needs to promote the both the pace of economic growth and its pattern (the participation of the poor);

- Policy must tackle the multi-dimensions of poverty which is mutually reinforcing;
- Policy needs to empower the poor by expanding their economic activity.

There are lessons to be learnt from the successes and failures of different countries in understanding the relationship between growth and pro-poor growth:

- Brazil could not sustain the high rates of growth of the 70’s because the productivity (the capabilities) of the workforce failed to increase (UNDP, 1996).
- India has increased its growth rate with slow progress in human capacity (OECD, 2006).
- China has done the reverse of Brazil and invested in human development before launching its successful sustained economic growth (OECD, 2006).

### 2.1.4. DIFD Pro-Poor Growth Policy Guidelines

DIFD has outlined four fundamental measures which need to be in place in order to promote pro-poor growth. Each measure or policy is seen as promoting a framework for economic growth to benefit the poor:

- Incentives for private investment:
  Macro and microeconomic policies need to be in place to promote economic and political stability and security in the markets and in the country so that new investments can generate jobs, improve skills, increase productivity and boost income. For example, the conditions in many sub-Saharan African countries of: irregular power supply, poor transport and telecommunications network, social and political conflict, crime – often perceived to be linked to the powers that be, private sector and government corruption and random taxation hamper the very foundation for investment.
• Foster international links:
Domestic markets are the fundamental foundation for economic and pro-poor growth, yet the international links can stimulate such growth through the transfer of knowledge, technology and management skills. And through these means open up new export markets will provide business partners, jobs and goods and services. There are opportunities for agriculture here. Policies here must consider: transport and communication, promotion of exports and barriers to imports in order to promote trade.

• Access to assets and markets:
Access to assets and markets permits the poor to participate in the process of growth. The assets requiring access cover comprehensively the entire societal spectrum and include the human, physical, natural and social aspects of development as well as the more traditional financial aspects. In order to achieve this access, governments need to promote schooling, reform land ownership and open the door to credit. The key to promoting access to assets is to establish an open market for labour and both for agriculture inputs and for selling produce. This promotes the pro-poor growth rate by stimulating the country’s economic growth rate by drawing more people into the economy and increasing the distribution of the growth to more people.

• Reduction of risks and vulnerability:
Risks and vulnerability for the poor can be reduced by implementing stable economic policies and include pensions, child grants, and public works programmes for the poor. Such a policy assists in creating foundation for pro-poor growth.

2.1.5. South African Context: Towards Pro-Poor Growth Policy Guidelines

In the South African context Piters’ study (2007: 12) found that developers identified the following drivers of agricultural pro-poor growth ranked in the order of
importance (these factors are similar to the global list of agricultural pro-growth drivers given above in section 2.1):

- Market access and lowering transaction costs
- An incentive framework that benefits all emerging
- Individual skills in agriculture
- Property rights for land
- Effective institutions (at all levels)
- Extension support, technical and entrepreneurial skills development.

2.1.6. Indicators of Pro-poor Growth for South Africa

Piters (2007: 21) outlined indicators to measure the effect of pro-poor growth in the socio-economic, political and cultural context of South Africa. The two dimensions of pro-poor growth each have their own measurements. There are 13 economic indicators and 7 poverty and inequality indicators:

2.1.6.1. Economic Growth Indicators for South Africa

- GDP growth
- Real per capita GDP growth
- Foreign direct investment
- Gross fixed capital formation
- Budget deficit before borrowing
- Government debt
- Interest rates: real and nominal
- Inflation measures: CPI and CPIX
- Bond points spread
- R & D expenditure
- Exports
- BEE transactions
- Black managers

2.1.6.2. Poverty and Inequality Indicators for South Africa

- Per capita income
- Inequality measures (e.g. Gini Coefficient)
- Poverty headcount index
- Poverty gap analysis
• Social-assistance support
• Life expectancy
• Living standards measure

2.1.7. Pro-Poor Growth Policy Guidelines Drawn from Eight Asian Case Studies

Hussain, Giordano and Hanjra (2003: 64-65) after using eight case studies from Sri Lanka, Pakistan (2 case studies), India, Bangladesh, People’s Republic of China (PRC), Indonesia and Vietnam identify two sets of broad interventions to increase the benefits of irrigation water to the poor. These interventions relate to cover the following policy areas:

- Institutional, legal, and regulatory policy
- Management, allocation, and participation
- Infrastructure and technology
- Economic and financial
- Research, knowledge, information, and capacity development

2.1.7.1. Pro-Poor Growth Policy Guidelines Drawn from Eight Asian Case Studies: Broad Interventions

These broad interventions are for the improvement of management of the water systems in order to improve the operation and implementation of irrigation systems. The broad interventions will have a direct and indirect impact on pro-poor growth and poverty reduction.

- Improve institutional environment and governance in the agricultural water sector.
- Involve communities in the management of agricultural water resources.
- Encourage public-private partnership in managing agricultural/irrigation water resources.
• Establish effective regulatory measures and mechanisms for transparency and accountability among service providers and water users.
• Establish clear water rights and water entitlements in the systems by introducing effective and enforceable legal frameworks with flexible provision for seasonal water use.
• Promote full O&M cost recovery to improve and maintain system performance (from which the poor benefit directly or indirectly) and to redistribute benefits of irrigation through larger contribution from the non poor for improving productivity of landless and marginal farmers.
• Introduce systems of advance payments of water fees by users to improve on collection rate.
• Promote shared management of surface and groundwater to help reallocate water to areas where groundwater is of poor quality.
• Develop, improve, and/or line canal infrastructure in areas where groundwater is not suitable for crop production.
• Introduce season-wise planning for equitable distribution and efficient use of available water resources.
• Improve markets for inputs and outputs.
• Improve economic value of water through diversification of both crop and non-crop farm outputs.
• Promote cropping pattern changes from high water-consuming crops to low water-consuming, but high-value crops (e.g., paddy to high-value crops).
• Clearly recognize and incorporate rural poverty concerns and the need and importance of pro-poor interventions in national and subnational-level policies and plans.

2.1.7.2. Pro-Poor Growth Policy Guidelines Drawn from eight Asian Case Studies: Targeted Interventions

The targeted interventions have been selected on the basis that each intervention will have a direct impact on pro-poor growth and poverty reduction.

• Promote pro-poor institutional arrangements, including
  ❖ Involving the poor/smallholders in water management decisions, i.e., establishing and strengthening water users associations (WUAs) with due representation of the smallholders and the poor; and
  ❖ Establishing and strengthening separate WUAs of tailenders in situations where there are significant head-tail inequities in water distribution.
• Establish guaranteed minimum water rights for smallholders in drought and scarcity conditions to ensure household food security.
• Especially where there is significant inequity in land distribution, establish pro-poor water allocation/distribution rules that will allocate more canal water per unit of area for smallholders as compared with large farmers. Give priority in water allocations to areas and command reaches where poverty incidence is higher.
• Promote canal water reallocations to canal command areas or reaches where groundwater is of poorer quality, mostly tail ends where incidence of poverty is relatively higher.
• Develop pro-poor (discriminatory) pricing systems such as differential pricing for larger areas beyond specified ceiling per farm household.
• Create employment opportunities for the poor, including the landless, by involving them in O&M, water fee collection, and other supervisory activities.
• Increase productivity and value of water in ways that favor the poor, such as promoting crop diversification toward high-value crops on smallholder farms through the provision of necessary incentives, information, and support.
• Target technological support, such as providing high-quality seeds, fertilizers, credit, and agricultural equipment to land leveling for the poor communities in canal commands.
• Provide monetary and technical support to install pumps or other water-lifting devices for communities in command areas or canal reaches that are relatively poorer but have good quality groundwater.
• Prioritize command areas or reaches with relatively greater poverty incidence for infrastructure rehabilitation and upgrading, and for new infrastructure for storage and distribution of water.
• Improve markets for the inputs purchased and outputs produced by the poor.
• Build capacity of smallholders and the poor through information and training programs.
• Develop databases on poverty, location, incidence, and depth of poverty, and monitor poverty regularly.
• Encourage research on agricultural water and poverty.

2.1.8. Towards a Higher Rate of Growth

The World Bank’s report (2005) on Pro-Growth in the 1990’s begins the executive summary with this following advice, “Policymakers who seek to accelerate growth in the incomes of poor people, and thus reduce overall poverty, would be well advised to implement policies that enable their countries to achieve in a higher rate of overall growth.”
3. Globalization and the LED Conversation

Globalization has created a new world in terms of new opportunities and constraints for nations, regions and cities all over the world. With this change in the real conditions of people in the world there has been a concomitant shift from traditional development theories to local economic development (ILO, 2007). The LED strategies are more holistic and comprehensive than the previous development strategies and they include:

- Empowerment of locality:
  LED strategies facilitate the trend of people around the world to determine their own future especially in terms of economic activity in their region.

- Institutional Transparency and Accountability:
  LED strategies facilitate making local institutions transparent for and accountable to the local communities.

- Comparative advantage
  LED strategies facilitate the grounding of local economic activities in niche markets where the comparative advantage benefits can accrue to the local residents.

- General improvement in the quality of the jobs
  LED strategies facilitate improvement in the quality of jobs owing to the greater participation of the local community in a growth economy.

The World Bank (2007) cautions on the importance of community involvement in the decision to go ahead with LED programmes and projects. LED programme areas are identified by the World Bank (2007) are extensive and taken together outline a comprehensive framework of LED initiatives. Each programme is enhanced by the synergy provided by a LED strategy which works on all or most issues simultaneously. These programmes are included:

- Improving local business investment climate
- Investments in hard strategic infrastructure
- Investments in sites and premises for business
- Investment in soft infrastructure
- Encouraging local business growth
- Encouraging new enterprises
- Promoting inward investment
- Sector development
- Business cluster development
- Area regeneration (or targeting)
- Integrating low-income or hard to employ workers

The Constitution of South Africa (Act 108 of 1996) drawn up in the era of LED takes these international trends one step further and creates a legislative framework to ensure that local government are empowered to promote social and economic development. This constitutional framework has been fleshed out in the South African Local Economic Development Policy and Strategy of 2003 which is about promoting local development for the benefit of all people (Davis, 2006).

Yet notwithstanding these bold moves research by Nel (2004) and Marais, Bote and Mosotoane (2002) demonstrates that most LED rural initiatives do not fail.
4. Economic Growth and Infrastructure: Pro-poor Growth and Infrastructure

Development literature has understood infrastructure investments as a significant, if not dominant factor, of economic growth. Theoretically, infrastructure is seen to work as a driver of economic growth through capital accumulation (directly) and through total factor productivity gains, i.e., gains in each factor of productivity such as labour or capital (indirectly). Economists argue that infrastructure facilitates private investment by lowering production costs and opening new markets. For example, roads and ports reduce the transport, transaction and trade costs – thereby making new destinations attractive to private investment Fedderke and Bogetic: 2006, 2). There is a positive pay-off in terms of economic growth from investment in infrastructure (Barro, 1990; Ghosh and Roy, 2002; and Krichel and Levine, 2001).

Infrastructure can be divided in economic and social infrastructure. The World Bank (1994) divides economic infrastructure into three groupings:

- Utilities (electricity, gas and water, telecommunications, sanitation, sewerage and solid waste disposal)
- Public works (water catchments in dams, irrigation and roads)
- Other transport (railways, roads, seaports, airports and urban transport systems).

Social infrastructure covers services such as health, education and recreation. Social infrastructure impacts on the quality of life. There is a direct economic impact through production and trade and indirect ones’ such as improved health and higher education which in turn impact on national productivity and production.

For the World Bank (2000/1) “poverty is pronounced deprivation in well-being”. Well-being is understood by the World Bank to cover a cluster of terms which can be operationalised and hence provide comparative benchmarks overtime or between states: income, health, nutrition, education, assets, housing, and human rights. The World Bank
(2001a) identifies three aspects of poverty: lack of income, insecurity and lack of political voice.

There is a growing literature which validates and substantiates the link between infrastructure and growth and pro-poor growth. Furthermore there is a growing understanding how growth stimulates infrastructure development. The World Bank (1994) was the first to emphasize the profound economic and social impact of infrastructure on development and outlined a programme for public-private partnerships.

Jerome and Ariyo (2004) identified the various channels through which investment in infrastructure can contribute to sustainable growth. These are:

- Reducing transaction costs and facilitating trade flows within and across borders;
- Enabling economic actors – individuals, firms governments – to respond to new types of demand in different places;
- Lowering the costs of inputs for entrepreneurs, or making existing businesses more profitable;
- Creating employment, including in public works (both as social protection and as a counter-cyclical policy in times of recession);
- Enhancing human capital, for example by improving access to schools and health centres; and
- Improving environmental conditions, which link to improved livelihoods, better health and reduced vulnerability of the poor.

Given the scope and scale of infrastructure operations and the services provided throughout the economy, infrastructure has a fundamental role to in promoting development. But this importance does not translated automatically into a pro-poor growth. What is required is a pro-poor growth framework in order to ensure that the benefits of infrastructure development can be harness to ensure pro-poor growth and the reduction of poverty.
An example of poverty reduction through infrastructure development is the following. An important link to poverty reduction through infrastructure development is the opportunities for employment generated by infrastructure projects and in the stimulation of the economy by these projects when completed. Labour intensive means should be considered when building infrastructure especially in the economic sectors which affected the poor directly. For Narayan (2002), “the lack of basic infrastructure – particularly roads, transportation and water is seen as defining characteristic of poverty.” It is precisely in these sectors that labour intensive solutions have been found in order to develop basic infrastructure such as roads, irrigation, drainage and sanitation, erosion control and water supply.


Using econometric methodology on South African economic data Fedderke and Bogetic (2006, 22) demonstrate that the “impact of infrastructure capital (is) not only positive, but of economically meaningful magnitudes.” Thus there is a direct relation between infrastructure provision and growth. In addition, as with World Bank Development Report 1994 there are “multiple (hence indirect) channels of influence between infrastructure and productivity improvements.”

When one considers and reflects on the future required infrastructure for South Africa it is important and worthwhile to briefly consider the pattern of economic infrastructural development since 1875 which demonstrates (with other economic data) a positive impact of infrastructure on economic growth (Fedderke and Bogetic: 2006, 4). This positive impact of infrastructure on economic growth highlights that the emerging developmental state of new South Africa should invest in a range of infrastructures.
South Africa has a distinctive pattern of roll-out which can be conceptualized in terms of waves (Fedderke, Perkins and Luiz, 2005).

The first wave of infrastructure development was railway development between 1875 - 1930. After this period there has been little growth in railway line construction though the rail traffic has increased.

The second wave of infrastructure development was inter-city roads reaching a peak in 1940. With the paving of roads focus shifted to provincial and national roads and continues today.

A long steady increase of infrastructure development occurred in the ports. Ports are the oldest form of infrastructure in South Africa but they grew rapidly as the railway infrastructure expanded and again with the expansion of the roads. There has been a steady growth in them up until the 1950’s. Port capacity was constrained because of the limitation of the number of ports. In the 1970’s two new ports were constructed – Richards Bay and Saldanha Bay – together these two ports doubled the volume of cargo handled in South Africa. (Ports were not considered as a wave by Fedderke et al.)

The final wave of infrastructure development was electricity and telephones. Beginning with Smuts in the 1920’s electricity power generation and distribution continued to expand until the 1990’s when only distribution expanded. Telephones growth rate slowed in the 60s to pick dramatically with the introduction of information and cell technology.

The emerging developmental state needs to consider infrastructural developmental in series of areas as well as rural areas and small towns as wave of infrastructural development. Notwithstanding the relationship between infrastructure development and economic growth “the economic infrastructure component of South Africa’s gross fixed capital formation and fixed capital stock of the public sector (both general government and public corporations) published by the South African Reserve Bank, both demonstrate
a long-term deterioration: from the mid-1970s in the case of investment, and from the mid-1980s in the case of fixed capital stock” (Fedderke and Bogetic: 2006, 4). Real GDP and public-sector economic infrastructural investment (gross) and fixed capital stock (all indices per capita) were measured for the period from 1960 – 2002. What becomes apparent is that investment per capita has fallen (measured in 1995 prices) from R 1268 in 1976 to R356 in 2002. This fall is a massive 72% decrease in the per capita rate of infrastructural investment. This decline is so massive and over such an extended period of time that it is not reversed by the current R400 billion spending on infrastructure. It would take years spending that sum annually (which is not case the infrastructure costs are spread out over time) to surpass the 1976 levels. Furthermore investment as a percentage of GDP fell from 8.1% of GDP to 2.4% of GDP. This change is 338% drop in investment.

For over a decade South Africa’s infrastructure investment has been below the international benchmark of between 3% - 6% established by Kessides (1993).

It is this anomaly that the South African developmental state will have to confront if South Africa is going to improve the living conditions of its people. This change will require a fundamental shift in government thinking to provide for continued infrastructural investment.
5. Rural Economic and Enterprise Development and Pro-Poor Growth

The Guide to Rural Economic and Enterprise Development (REED) (2003) operates within the context of poverty reduction through economic growth, i.e., pro-poor growth. “REED views entrepreneurs and the private sector as the main drivers of sustainable rural development, and emphasises the importance of providing an enabling environment for market-oriented economic activities” (REED: 2003, 1). There is a public policy element for the provision of basic infrastructure.

Pro-poor growth can be brought about by rural economic development strategies if there is facilitation of:

- Enterprise development
- Effectively functioning institutions
- An enabling policy environment

The long term aim of REED is for rural economic development to promote the sectoral linkages between agriculture and agribusiness and non-agricultural economic activities to ensure sustainable development. The REED approach “aims at diversification and innovation of the rural economy, increasing its market orientation, and fostering value addition to rural products. The intensification of agriculture and the transformation of agricultural and natural resource products will lead to additional non-farm employment, increase local incomes, and greater demand for local agricultural and non-farming products” (REED: 2003, 1). In this framework subsistence farmers can graduate to providing improved, diversified and sustainable livelihoods.

The ten identified cornerstones are based on the analysis and best practices of programmes and projects by a multidisciplinary team of international practitioners. These ten cornerstones outline a complex and holistic framework for implementing strategies, programmes and projects; they are the identified core functions of successful rural economic and enterprise development and they need to be provided for if a programme or
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project is to be successful. Though the ideas reveal an in-depth understanding of pro-poor growth they are presented in a user-friendly manner to ensure that professionals and stakeholders have easy access to a development framework within which they can implement their programmes and projects. Above all else the cornerstones are a guide to the facilitation of development. The ten cornerstones for successful intervention are:

1. An enabling environment that provides attractive investment climate and fosters dynamic entrepreneurship;
2. Adequate mechanisms and structures that address local needs;
3. Active private sector institutions and linkages;
4. Functioning and effective infrastructure (hard and soft);
5. Access to integrated and open markets;
6. Access to effective and efficient support services and resources;
7. Adaptive management capacity and entrepreneurial competence within business and enterprises;
8. Local organisations, groups and associations (representing the poor) as building blocks;
9. Active participation in and ownership of development processes by well-linked stakeholders; and
10. Ongoing learning from successes and failure by all stakeholders.

These cornerstones can be classified into four categories:

- Policies and institutional framework
- Infrastructure, services and markets
- Entrepreneurial competence
- Stakeholder involvement and linkages

From studying the material of REED it is apparent that the Guide to REED encapsulates a systematic understanding of process. In other words the thrust of REED is action orientated; it is a guide on how to do or how to plan and implement pro-poor growth development.
Each cornerstone is involved in the process planning and implementing development strategies, programmes and projects. Even though there may be different points of entry depending on opportunity, funding or particular interests of the community or professional each cornerstone needs to be incorporated into the programme or project to ensure success. Each cornerstone is critical to the success of the policies, strategies, programmes and projects. All cornerstones need to be considered.

The Guide to Rural Economic and Enterprise Development (2003) offers a “tool for developing strategies and programmes, for analysing, prioritising and evaluating stakeholder interventions, and for creating a common vision among development partners” (REED: 2003). The Guide to REED “is envisaged as an effective analytical instrument for assessing and improving policies, institutional development, and intervention programmes and projects for more systems-based and comprehensive intervention by all partners” (REED: 2003, 4).

The fourth cornerstone in the Guide to REED – Functioning and Effective Infrastructure (hard and soft) – will be reviewed in detail although it is only one of the elements that offer insightful guidelines to the thrust of this research project which seeks to monitor and evaluate the success of smallholders’ irrigation projects – in particular by assessing the impact of irrigation on income.

For the Guide to REED the answer to why this cornerstone is important is as follows: “Investment in infrastructure encourages pro-poor growth, and improves opportunities for employment. People in rural communities would benefit from improved access to infrastructure and this could reduce the risks and transaction costs related to production and distribution” (REED: 2003, 27). “Ideally, rural enterprises should have ready access to rural infrastructure and should use it to conduct their business in the most efficient way” (REED: 2003, 28). Infrastructure enables the rural entrepreneur as follows:

- Access to inputs
- Access to markets
- Minimise the costs of doing business
- Facilitates the production process

Infrastructure has an overall positive impact on the rural population as it:
- Improves quality of life
- Improves the socioeconomic opportunities of rural life
- Improves the environmental benefits

The aim of this cornerstone for REED is to create “access to hard and soft, functioning and effective infrastructure, both hard and soft”. Rural infrastructure is either lacking or rural people lack access to it or it is poorly managed and maintained.

The main actors engaged in supplying operating and efficient infrastructure are:
- Governments (all levels) e.g., regulatory bodies, state and parastatal service providers;
- The private sector (enterprises, consumer organisations, large-scale investors);
- Rural communities and their organisations and associations.

A wide range of rural infrastructure is identified each of which would encourage pro-poor growth and improves the opportunities for employment. This infrastructure is divided in hard and soft infrastructure (REED: 2003, 29).

<table>
<thead>
<tr>
<th>Hard Infrastructure</th>
<th>Soft Infrastructure</th>
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<tbody>
<tr>
<td>• Electricity supply</td>
<td>• Financial and other business service-providing institutions, eg, commercial banks, advisory services</td>
</tr>
<tr>
<td>• Housing</td>
<td>• Healthcare and other social/welfare systems</td>
</tr>
<tr>
<td>• Marketplaces</td>
<td>• Informal savings clubs</td>
</tr>
<tr>
<td>• Offices and business premises</td>
<td>• Markets</td>
</tr>
<tr>
<td>• Roads and haulage providers</td>
<td>• Post and courier services</td>
</tr>
<tr>
<td>• Other transport systems, eg, railways, air services</td>
<td>• Training</td>
</tr>
<tr>
<td>• Sanitation and waste management</td>
<td></td>
</tr>
<tr>
<td>• Schools</td>
<td></td>
</tr>
<tr>
<td>• Shops and other ‘town’ services</td>
<td></td>
</tr>
<tr>
<td>• Storage facilities</td>
<td></td>
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<tr>
<td>• Supply of gas</td>
<td></td>
</tr>
<tr>
<td>• Telecommunications</td>
<td></td>
</tr>
<tr>
<td>• Water supply</td>
<td></td>
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</tbody>
</table>
These infrastructures will ensure that rural enterprises can compete in the marketplace whether local, regional, national or international. In assessing rural infrastructure one must look at present needs and project future needs so that pro-poor growth does move into any bottlenecks. REED identifies the main challenges facing rural infrastructure as follows (REED: 2003, 30).

The Guide to REED outlines a step by step programme on how to set up functioning and effective infrastructure. This is useful and it also provides some themes for the research project into smallholders’ irrigation schemes. Such themes as identifying the infrastructure required, surveying business (and community) needs, increase in volumes using infrastructure, maintenance, maintenance costs, identify innovative management structures, need for cost recovery services and networking links (for supplies and markets). Cornerstone four (infrastructure) is included in this review to demonstrate the specific detail of the REED programme and because of its flexibility in providing guidance to policy and strategies and as argued here to research projects.

Table for Cornerstone 4: Functioning and effective infrastructure (hard and soft)

<table>
<thead>
<tr>
<th>Content</th>
<th>Key strategy and process</th>
<th>Possible way to implement</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Identifying the infrastructure required by rural enterprises</td>
<td>1. Assess the existing infrastructure and identify gaps and the necessary improvements; 2. Improve access to the infrastructure; 3. Identify ways and means to reduce the costs of accessing the infrastructure.</td>
<td>1. Survey of existing infrastructure and business needs; 2. Identification of priorities and contributions in multi-stakeholder forums; 3. Increase in the volume of goods or services using the infrastructure; 4. Provision of low-cost solutions to enterprise needs.</td>
</tr>
</tbody>
</table>
| 2. Providing the required infrastructure | 1. Encourage public and private investment in infrastructure; | 1. Development of sound proposals for new or improved facilities with benefits to rural enterprise and the public. 1. An independent regulatory }
Chapter 3 of the Guide to REED deals with “Guidelines for application” (REED: 2003, 80 - 85). Here it is outlined how to apply the guide. The Guide to REED can be used:

1. as a diagnostic tool for assessing the nature of the existing interventions;
2. as a tool for developing strategies and designing new programmes and projects – to prioritise core activities;
3. as a tool for monitoring and evaluating on-going programmes and projects. The tool helps to reach a common perspective on where the project is, what is considered successful, and what knowledge and design gaps there are;

| 2. Privatise state utility service providers; | body; |
| 3. Promote local, self-funded facilities, e.g. collective or co-operative services; | 2. Invitations to tender for management of services delivery contracts. |
| 4. Establish facilities on a correct and legal basis, e.g., access. | 1. Development of innovative schemes for self-funding. |
| 1. Promote schemes to fund maintenance of local infrastructure (public and private); | 1. Investigation into the local regulatory or legal position. |
| 3. Raise public awareness of the need for cost recovery services; | 1. Investigation into the local regulatory or legal position. |
| 4. Design a system for settling disputes settlement system between private and public partners during the period of operation; | 1. Development of innovative schemes for self-funding. |
| 5. Guarantee the fulfilment of contract arrangements during the period of operation. | 1. Investigation into the local regulatory or legal position. |

| 3. Maintaining infrastructure | 1. Schemes based on agreements with all parties, i.e., management contracts; |
| 1. Foster links and networking. | 2. Public services offered by reliable private entrepreneurs; |
| 2. Promote innovative private management structures; | 3. Cost structures and maintenance costs that are available to the public; |
| 3. Raise public awareness of the need for cost recovery services; | 4. Independent person (church) to act as arbitrator. |
| 4. Design a system for settling disputes settlement system between private and public partners during the period of operation; | |
| 5. Guarantee the fulfilment of contract arrangements during the period of operation. | |

| 4. Integrating into bigger (wider) systems | 1. Involvement and representation of rural enterprises in the infrastructure planning process. |
| 1. Foster links and networking. | |
| 2. Promote innovative private management structures; | |
| 3. Raise public awareness of the need for cost recovery services; | |
| 4. Design a system for settling disputes settlement system between private and public partners during the period of operation; | |
| 5. Guarantee the fulfilment of contract arrangements during the period of operation. | |

| 5. Meeting required standards, e.g., quality, dimensions | 1. Keeping up to date with standards; |
| 1. Ensure that all infrastructure developments meet the required standards. | 2. Development of new standards as needed. |
| 2. Public services offered by reliable private entrepreneurs; | |
| 3. Cost structures and maintenance costs that are available to the public; | |
| 4. Independent person (church) to act as arbitrator. | |
4. as a knowledge management tool. Lessons learnt by applying these tools can be feedback into the programme;

5. as a tool to create a common understanding and vision among the stakeholders and partners.
6. Infrastructure and Pro-Poor Growth

A DAC document Promoting Pro-Poor Growth: Policy Guidance for Donors (2006) states “Reliable, efficient infrastructure is crucial to economic and social development that promotes pro-poor growth. By raising labour productivity and lowering production and transaction cost, economic infrastructure – transport, energy, information and communication technology, and drinking water, sanitation and irrigation – enhances economic activity and so contributes to growth, which is essential for poverty reduction.” Although social infrastructure such as health, education and culture are important the pro-poor growth rests fundamentally on the economic infrastructure of transport, energy, information and communication technology, and irrigation, drinking water and sanitation. This type of infrastructure requires the provision both physical facilities (roads, energy generation, water connections) and services (transport services, energy and water supply). In order to establish this type of infrastructure there must be investment, management, maintenance, capacity building and policy building.

Over 1 billion people lack access to roads, 1.2 billion lack safe drinking water, 2.3 billion lack reliable sources of energy, 2.4 billion lack sanitation facilities, 4 billion lack access to electronic communication services. Without such infrastructure poor people pay heavily in time, money and health – and in shorter lives.

Current worldwide projections for infrastructure spending is estimated to be 5.5% of GDP in developing countries and 9% in the least developed countries (IMF and World Bank, 2005). The average current spending on infrastructure is 3.5% of GDP in developing countries.

Since the mid-80s public investment in infrastructure has levelled off and indeed investment in infrastructure has fallen as a percentage of both total government expenditure and GDP (Fan and Rao, 2003). Furthermore during the 80s there in fact was a 30% decline in infrastructure spending. Using constant 1995 prices, Fan and Rao found
that government spending for 43 countries on infrastructure (transportation and telecommunication) increased slightly from $83.5 billion to $89 billion between 1980 and 1998. The spending of all 43 countries on infrastructure as a percentage of GDP declined from 2.1% of GDP in 1980, to 0.86% in 1990 and to 0.81% in 1998.

The declines in spending as a percentage of GDP for the continents between 1980 and 1998 were:

- Africa’s infrastructure spending declined from 1.86% to less than 1.1%
- Asia’s infrastructure spending declined from 2.2% to less than 1%
- Latin America’s infrastructure spending declined from 1.92% to 0.9%.


The declines in spending as a percentage of government budgets (overall spending) for the continents between 1980 and 1998 were:

- Africa’s infrastructure spending declined from 6% to less than 4% (Africa’s defence spending was 10%)
- Asia’s infrastructure spending declined from 12% to less than 5%
- Latin America’s infrastructure spending declined from 11% to 5%.


According to Fan compared to Asia and Latin America the road “situation in sub-Saharan Africa is even more worrisome” (Fan, 2004: 4). The World Bank has found that the road density in rural sub-Saharan Africa is 34m/km². This represents only 4% of the density of India and 23% of the density of China. Rural transport cost in rural Ghana and Zimbabwe are 2 – 2.5 times higher than in Thailand, Pakistan, and Sri Lanka (Torero, 2004). Chan-Kang (2004) showed that low quality road investment have an impact more than 4 times that of high quality roads.

“Because of insufficient investment, inadequate planning, poor maintenance and unsustainable sector governance, most DAC partner countries – especially low-income counties – suffer huge gaps in infrastructure. Without major progress, it will be
impossible for these countries to significantly reduce poverty and achieve the Millennium Development Goals (MDGs). The main challenge is to foster a dynamic growth process that develops infrastructure services and involves and benefits the poor” (DAC, 2006:19).

The performances of the developing countries in achieving the MDGs targets over the past decade are mixed. In South Asia the poverty rate and the number of poor declined, though the prevalence of malnutrition here is the highest in the world. In contrast Africa both the poverty rate and the number of poor increased. A more effective strategy is required. Without increased public investment in infrastructure the MDGs targets are but a dream.

Infrastructure according to DAC (2006) supports pro-poor growth by:

- Enhancing economic activity and thus overall economic growth – for example, by reducing production and transaction costs, increasing private investment, and raising agricultural and industrial productivity.
- Removing bottleneck in the economy which hurt people by impeding asset accumulation, lowering asset values, imposing high transaction costs and creating market failures. Eliminating these bottlenecks allows the poor to contribute to growth directly though the employment and income opportunities created by the construction, maintenance and delivery of infrastructure services, and indirectly through better services.
- Generating distributional effects on growth and poverty reduction through poor people’s increased participation in the growth process – for example, by increasing their access to factor and product markets, reducing risk and vulnerability, enhancing asset mobilization and use, and promoting their empowerment.

The literature points to direct and indirect links between irrigation, roads, electricity and communication and pro-poor growth leading to poverty reduction. In the case of irrigation, the direct linkages function directly by reducing poverty at the smallholder
level. The indirect linkages function indirectly on poverty reduction through aggregate or national level (These points are discussed in detail below in this section).

The direct linkages of irrigation on pro-poor economic growth are as follows: Irrigation investments have a positive effect in stimulating pro-poor economic growth. The smallholders achieve higher production, higher yields and a lower risk of crop failure using higher-value market oriented produce. Such an increase in the quantity and quality of produce increases their income and makes more food available and affordable for the poor. This increase in economic activity simulates the local markets which create new opportunities in land, labour and commodities.

The indirect linkages of irrigation on pro-poor economic growth operate national. The economic activity stimulates employment and wages and the national economy is boosted by providing labour, human and physical capital, cheaper food, as well as providing new markets for urban based businesses and services which meet the increasing demands of the rural communities. The scale of the indirect benefits is often many times that of the direct benefits to the smallholder.

In addition, infrastructure saves time in human effort especially with regard to transportation of crops and other commodities, and the carrying of water.

6.1. Green Revolution

The success of the Green Revolution in the 60’s and 70’s rested on rapid expansion of areas under irrigation coupled with availability, access to new technologies for irrigation and high yielding cultivars with new improved fertilizers and careful management of the schemes.

In the later half of the 20th Century irrigation agriculture came to be seen as a fundamental component of the world food production. The Green Revolution has seen
the success of irrigation as the prime factor in maintaining national and indeed world food security. Not has irrigation led to household food security for the poorest of the poor it has stimulated economic growth leading to further reduction of rural poverty.

Between 1959 and 1997 the total irrigation in the world was increased by 250% to 266 million hectares (FAO 1998). Today about 17 percent of the total world agricultural land is irrigated. This 17% contributes approximately 40 percent of the global production of cereal crops (WCD 2000).

Between the early sixties (1961-65) and 1997, the per capita per annum cereal production in developing countries increased from 200 kg to more than 260 kg. As the world population has increased from 3 billion to 6 billion during the same period (FAO 2000) this per capita per annum increase represents not a 130% increase (increase from 200 to 260) but an increase of 260% (from 200kg to 520 kg). This improvement in food security has demonstrated that irrigated agriculture generates rural employment and helps maintain rural livelihoods in general.

Asian economies, in particular India, China and Pakistan, have invested in agricultural irrigation which has led to a rapid increase in agricultural production over a relatively short period of time. Studies have identified irrigation infrastructure as one of the critical factors for improving agricultural production especially if coupled with improved cultivars and fertilizers and roads and electricity. Such improved production is has been shown improves farm incomes and rural wealth (capital) accumulation.

India, China and Pakistan have reduced the scale of poverty to a large extent. There has been widespread success of poverty reduction due to irrigated agriculture. Today over 60 percent of the rice production and 40 percent of the wheat production in developing countries is irrigated. Given the success of the Green Revolution with irrigated agriculture and better irrigation access the impact on poverty reduction and food security is unquestioned. Only the scale of the impact in terms of the broader economy in terms of further benefits is still debated. (Bhattarai, Skthivadivel and Hussain 2002: 1-2)
6.2. Analytical Framework: An Introduction to Understanding Infrastructure Impact

The debate in the 1990s over the impact of infrastructure on poverty alleviation has been resolved by the measurable results of poverty reduction from economic growth within a sound macroeconomic and good governance framework and investment in physical infrastructure which has contributed to inclusive development. Infrastructure must operate within a social environment which provides greater access for the poor to all the modern public services of education and health, sanitation and water; in addition the economic environment must provide markets for produce, employment and credit facilities.

Before proceeding with an analysis of the impact of infrastructure on poverty the economic context of poverty needs to be outlined so that the role of infrastructure can be understood in context. Studies have demonstrated that there is a relationship between rural poverty and land size of farmers. This relationship should be of no surprise but it needs to be stated. Poverty tends to increase from large farms to small, from small to marginal, from marginal to sub-marginal and from sub-marginal to landless. The demonstrable reason for this is that crop income depends on the area of cultivated and of course agricultural productivity. There is a tendency for the source of income to decreases as land size decrease and for wage income to increase as the wage earner owns or has access to less and less land. Agricultural productivity in rural areas and non-agricultural productivity of rural jobs in the rural areas are the foundation and mainstay of the rural economy. It is the relationship between crop yield, agricultural jobs and non-agricultural jobs – the fundamental generation of rural income – that infrastructure such as roads and electricity and in particular irrigation, with new cultivars and fertilizer, can stimulate and change.

DFID 2002 found that approximately 70% of developing countries infrastructure investment is funded by governments or public utilities. Thus the identification of the importance of investing in infrastructure as a means of leveraging development is not
matched by the availability of funding. Given these funding constraints, “it is important to assess the relative contributions of physical infrastructure investments to poverty reduction” so that the best political and financial decisions can be taken to stimulate pro-poor growth (Ali & Pernia, 2003: 3). In order to analyze these impacts Ifzal Ali and Ernesto M Pernia propose to unpack “the link between physical infrastructure and poverty reduction, with particular reference to the rural sector where the vast majority of the poor reside” (Ali & Pernia, 2003: 4). The following discussion draws on their insights from “Infrastructure and Poverty Reduction – What is the Connection?” They identify an analytical framework see Figure 1: Simple Analytical Framework Depicting the Links between Infrastructure and Poverty Reduction in terms of which they analyze the cascading impact of infrastructure on poverty reduction. They focus their discussion on three types of infrastructure – roads, irrigation and electricity.

The simple analytical framework the main determinants and hence the solution to poverty include agricultural productivity, non-agricultural employment, and non-agricultural productivity. “Figure 1 summarizes the links form infrastructure investments (areas of intervention) through these determinants (areas of influence) to the poor (person’s) wages and employment (direct channel), on the one hand, and rural economic growth (indirect channel) that influences the supply and prices of goods, on the other. The final links are to real income/consumption of the poor and, consequently, poverty reduction (area of concern).”

An example of irrigation investment highlights these links. For example, a smallholder’s irrigation scheme results in an increase in agricultural productivity, i.e., improved crop yield, non-farm employment as a result of the increased economic activity in the area, and non-farm productivity as the local market can afford to be more selective in response to the desire by individual’s to protect their new economic advantages. Overall this increase in economic activity increases the demand for employees - the employment of the poor – and through this increased demand raises the wages of the poor. This increase is the direct channel in the figure leading to increased income distribution and thence increased consumption of the poor. The indirect channel leading to increased income and
consumption of the poor is a result the increased supply and prices of goods and services brought about by the higher economic growth from the higher productivity and increased employment. Similarly, roads and electricity can have the same cascading economic effect.

Figure 1: Simple Analytical Framework Depicting the Links between Infrastructure and Poverty Reduction

Infrastructure Investment

<table>
<thead>
<tr>
<th>Areas of intervention</th>
<th>Roads</th>
<th>Irrigation</th>
<th>Electricity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Areas of influence</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Agricultural productivity</td>
<td>Non-agricultural employment</td>
<td>Non-agricultural productivity</td>
<td></td>
</tr>
<tr>
<td>Rural economic growth</td>
<td>Wages &amp; employment of the poor</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Supply and price of basic goods</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Real income/consumption of the poor</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>POVERTY REDUCTION</td>
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Ali and Pernia (2003: 5) suggest that this analytical “could be used in the designing future empirical work that aim to trace more carefully and systematically the links of interest.” Indeed, this analytical model is the best research tool found in the literature for income studies measuring the connection between physical infrastructure and poverty reduction.

6.3. Economic Data Demonstrating a Connection Between Infrastructure and Poverty Reduction

Economic studies demonstrate that rural infrastructure investments lead to poverty reduction by raising mean income and consumption thorough higher agriculture and non-farm productivity which stimulates employment and income opportunities leading to an increase of wage goods. Yet allowances must be made for each countries special characteristics as well as the fact that the initial returns on poverty reduction are higher but with further investment in infrastructure the marginal returns decline and impact on reducing poverty is low.

Econometric models do not compute the links between infrastructure and poverty reduction in detail though such models have provided quantitative and statistical analysis of the critical links in the relation between infrastructure and poverty reduction through economic growth. Such measures are made in terms of elasticity which is a measure of responsiveness of dependent variables to independent variables. The dependent variables are quantities which respond to changes in the independent variables. The impact of the infrastructure of roads, irrigation and electricity in a number of case studies is presented in terms of measurements of elasticity.

6.3.1. Irrigation impact on poverty reduction

The following studies demonstrate that for every increase in irrigation investment there is response in the reduction of poverty because of measurable (in terms of elasticity) economic growth. Irrigation impacts directly on poverty reduction through farm productivity and employment and indirectly on poverty through overall income growth.
6.3.1.1. Impact of Irrigation in the China (PRC)

Fan, Zhang and Zhang (2002) found that for every 1% increase in the investment of irrigation is associated with a 0.41% rise in agricultural output per worker furthermore this rise resulted in 1.13% drop in the incidence of poverty.

6.3.1.2. Impact of Irrigation in the Philippines

In the Philippines, Balisacan and Pernia (2000) found that land quality, such as the availability of water, and not simply the quantity (size) of land that impacts on the incomes of the poor. For every 1% increase in the investment of irrigation is associated with a 0.31% rise in income.

6.3.1.3. Impact of Irrigation in the Philippines

Van de Walle (1998) found irrigation in Vietnam which targeted smallholders with small per capita landholdings benefitted the poor the most. The poorest had a crop income increase of 4.5% of household expenditure. In contrast the richest cohort only increased by 0.1%. Van de Walle also showed that primary education in Vietnam coupled with irrigation ensured a 36% increase of income on irrigated lands compared to unirrigated.

6.3.1.4. Impact of Irrigation in the Bihar, India

Bhattarai, Sakhivadivel and Hussain (2002) calculate the farm income from irrigated farms is 77% higher than in areas without irrigation.

6.3.2. Roads impact on poverty reduction

The following studies demonstrate the impact of roads on the reduction of poverty through economic growth. Roads have an elasticity between economic growth and poverty reduction.
6.3.2.1. *Impact of Roads in Indonesia*

In Indonesia, Kwon (2000) calculated a growth elasticity with regard to poverty incidence of -0.33 for provinces with good roads and -0.09 for provinces with bad roads. The measurement indicates that for every 1% growth in provincial GDP the poverty drops by 0.33% and 0.9% respectively. In another Indonesian study Balisacan, Pernia and Asra (2002) calculated the responsiveness of income because of the impact of roads on growth to have an elasticity of 0.05.

6.3.2.2. *Impact of Roads in the Philippines*

In the Philippines, Balisacan and Pernia (2000) calculated that investment in roads, coupled with schooling, impacted on poverty reduction. Every 1% increase in road access with schooling leads 0.32% rise in income of the poor.

6.3.2.3. *Impact of Roads in China (PRC)*

In China, Fan et al. (2002) found that investment in roads reduces poverty through agricultural productivity and non-farm employment. The impact of roads has an elasticity of 0.08 for agricultural GDP per worker and 0.10 for non-agricultural employment. Jalan and Ravallion 2002 found that household consumption rose by 0.08% for every 1% increase in kilometres of roads per capita.

6.3.2.4. *Impact of Roads in Vietnam*

In Vietnam, Glewwe et al. (2000) demonstrated that paved roads in poor rural communities gave the poor households a 67% higher probability of escaping poverty than those in communities without paved roads.

6.3.3. **Electricity impact on poverty reduction**

Electricity is a known contributor to economic growth and to the growth of the rural economy. In poor countries rural electrification is often too expensive owing to high
connection costs. Rural electrification is further hampered by unclear land rights, low overall income, poor financial support, and in some areas low potential for agricultural improvements. Such obstacles are in danger of shutting out the poorest of the poor from the benefits of economic growth.

6.3.3.1. *Impact of Electricity in China (PRC)*

In China, Fan et al. (2002) found that investment in electricity reduces poverty through growth in the non-farm sector. There is an elasticity of 0.42 on poverty reduction.

6.3.3.2. *Impact of Electricity in Indonesia*

In Indonesian, Balisacan and Pernia (2002) found that investment in electricity reduces poverty and directly through increased employment and incomes. Balisacan and Pernia found that though electricity positively influences the incomes of the poor the impact is greater for upper poor (the relatively better off poor) than the poorest of the poor, whose poverty is a barrier to entry into electrification.

In a study of 40 countries Thirtle et al. (2001) found that “the elasticity of incidence of poverty to agricultural productivity growth was about 1% that is, the percentage of those living below the dollar a day poverty line fell by close to 1% for every percentage increase in agricultural productivity.

Based on the above discussion it is evident from the econometric literature on infrastructure that irrigation and roads have a significant the direct and indirect impacts on poverty reduction. It is clear that education also plays a role in increasing incomes. In contrast the impact of electricity is more muted not because there is no positive income rather because of the barriers to entry for the very poor. Electricity can therefore be viewed as programme to be introduced once roads and irrigation have been introduced to drive economic growth further.
From these studies a clear case can be made for government investment in physical infrastructure in order to stimulate pro-poor growth and thereby achieve long term poverty reduction. These studies reveal a vast potential in rural areas, the home of the vast majority of the world’s poor, to contribute to national economic growth through government investment in rural infrastructure thereby raising agricultural productivity and employment.

Synergy between infrastructures should be nurtured by locating the infrastructure in key targeted areas able to drive the development and growth of larger areas. Canning and Bennathan (2000) demonstrate that there are complementarities between physical and human capital investment and most importantly the physical infrastructure investments were shown to have rapidly diminishing returns if carried out in isolation without human capital investment.

6.4. The Multiplier Effect: Multifaceted Understanding of the Socio-Economic Impact of Irrigation

The direct impact irrigation infrastructure on increasing crop yield, agricultural productivity and farm income is reported in the literature. What is lacking for Bhattarai, Skthivadivel and Hussain (2002) is an analysis of the “indirect impacts like rural employment and economic multipliers associated with the provision of irrigation in a region” Bhattarai el al. (2002: IV).

The multiplier effect measures the effect of increased spending – investment - in one part of the economy on other parts. The basic formula for the economic multiplier, in macroeconomics, is the change in equilibrium GDP divided by the change in investment (i.e. the initial increase in spending). The multiplier effect is a tool used by governments to restimulate the economy through stimulating aggregate demand. The initial investment creates more jobs, which in turn means more spending in the economy which creates more jobs and more income. An expanding ripple effect is created – this is the multiplier effect.
For example: a government invests R10 million to build an irrigation scheme. The money becomes wages to those constructing the scheme and those supplying pumps. The rural workers will have higher disposable incomes through working, so local consumption rises hence new jobs are created as aggregate demand rises. The multiplier effect measures the number of times the economy turns over – the multiplier effect – the increased income from the cycles of spending and consuming initiated by the investment.

For Bhattarai el al. (2002: IV), “The scale of the multiplier effects generated in an irrigated agricultural society depends upon the level of backward and forward linkages operating in the particular regional economy, i.e., the nature and scale of inter-linkage within and among rural enterprises and the inter-linkages with market infrastructure.” The increased yield through irrigation does not create a massive impact on poverty on its own; it does however sustain the multiplier effect of the original investment. “The impact of irrigation on poverty reduction depends upon the structure of a rural economy and on how the additional farm income generated by improved access to irrigation is actually spent within a rural economy, and its feedback impacts on rural employment and wage structures. Therefore the level of multipliers operating in a regional economy is crucial in determining the impact of irrigation on the poverty status and the inequalities in income distribution within that particular economy.”

Thirtle et al. (2001) categorize the forward and backward linkages into:

- Production linkages – higher demand for agricultural inputs and services, including processing, storage, and transportation;
- Consumption linkages – higher demand for consumer goods backed by higher ability to spend and willingness to spend (higher real disposable incomes)
- Human capital linkages – higher income and food consumption culminating in better nutrition, health, and human capital formation.

6.4.1. Impact of Infrastructure in different countries
6.4.1.1. Impact of Irrigation in the Australia

Bhattarai, Sakhivadivel and Hussain (2002) use the multiplier effect to demonstrate that for every dollar invested in irrigation there is a multiplier of six, i.e., five dollars of value added to the regional economy in New South Wales, Australia. Similarly, the multiplier effect is 4.75 for generation of employment.

6.4.1.2. Impact of Irrigation in the Malaysia

Haggblade et al. (1991) cite Goldman and Squire (1982) who estimated that the Muda Valley irrigation scheme in Malaysia had an income multiplier of 1.71. This means that for every dollar increase in agricultural income from irrigation an additional 71 cents in rural non-farm goods and services were generated.

6.4.1.3. Impact of Irrigation in India

Bhattarai et al. (2002) estimate the aggregate irrigation multiplier for all of India is approximately 3.15. For every dollar increase in income for agriculture under irrigation a further $2.15 is generated in the income in response to the increased agriculture income.

6.4.2. The Multiplier Effect: Measuring Socioeconomic Impacts - the Positive Externality Effects - of Irrigation

Following Bhattarai el al. (2002) it is fruitful to list the benefits of irrigation investments – this multiplier effect of irrigation investment impacts on larger sections of society beyond the farming community. Chambers (1988) and Barker et al. (2000) argue for taking the increase in income and employment – the indirect benefits of irrigation – into account along with increasing crop production and farm and family incomes in order to assess rural poverty reduction. Irrigation benefits are not limited to farming households but cascade into rural service sector and other off-farm employment (Mellor: 1966). What is important is the feedback process which generates additional income (wealth creation) and jobs.
“The total beneficial impacts of irrigation development, both direct and indirect, can be summarized under the following categories:

1. Increased crop production (yield improvement) and increased farm income.
2. Increased cropping intensity and crop diversification opportunities and the feasibility of year round crop production activities.
3. Increased farm employment—more employment opportunities for farming families as well as for hired laborers in the locality.
4. Increased farm consumption and increased permanent wealth (permanent asset accumulation due to irrigation). This has significant implications for reducing intrinsic food insecurity in a region.
5. Reduced food (crop) prices allowing access to food for all, which is more beneficial to landless and subsistence families and provides better nutrition intake. This is also equally beneficial to urban poor and city dwellers, since they spend more than 50 percent of their daily income on food items.
6. Reduced friction in the rural economy and reduced transaction costs including reduced farm marketing costs due to increased access to farm link roads and to other improved farm and non-farm related services in the region.
7. Multiple uses of water for bathing, washing, livestock and home gardens.
8. Increased recharge of groundwater, easy access to groundwater and less drudgery for women in fetching water for daily household needs.
10. Increased farm income (for farmers) and increased farm and off-farm employment opportunities for rural landless laborers result in better school attendance of children of farm laborers and improved social capital in society. This is due to the income effects of irrigation, since education is still a luxury compared to other basic needs: foods, clothes, shelter, health, etc.
11. Export tax revenue accruing to government coffers; this is important particularly for the major agricultural (rice) exporting countries like Thailand, Vietnam, USA, etc.

The indirect impacts such as forward linkages (farm product markets) and backward linkages (farm input market) and issues such as reduction in transaction costs, institutional development, improved quality of life, and improved livelihoods are difficult to measure and this limits the economic analysis of a locality or project.

For Hussain, Giordano and Hanjra (2003) identify five key poverty-reducing variables which impact on the socioeconomic improvements of the community. These five key variables as with Bhattarai el al. (2002) list above are an attempt to cover the total
beneficial impacts of irrigation development, both direct and indirect. These interrelated variables are:

- Production
- Income and Consumption
- Employment
- Food security
- Other social impacts contributing to overall improved welfare

Figure 2: Agriculture Water and Poverty Reduction: Key Dimensions sets out the five key variables with the key impacts for each variable. These key impacts, as with Bhattarai et al. (2002) list above, are an excellent guide to research themes measuring the impact of irrigation schemes.
Figure 2: Agriculture Water and Poverty Reduction: Key Dimensions

- **Production**
  - Increased crop yields
  - Increased crop areas
  - Increased cropping intensity
  - Increased crop diversification
  - Opportunity for year-round cropping

- **Income/Consumption**
  - Increased income from crop
  - Increased family consumption of food
  - Stabilization of farm family income
  - Reduced food prices

- **Employment**
  - Increased on-farm and employment opportunities
  - Off-farm
  - Stabilization of employment opportunities
  - Increased rural wage rates

- **Vulnerability/Food Security**
  - Enhanced food availability
  - Increased opportunities to produce and retain food for home consumption
  - Reduced risk of crop failure
  - Reduced seasonally effects of production

- **Other Impacts**
  - Reduced out migration
  - Reduced indebtedness
  - Increased resources for health and education
  - Improved overall resource base
6.5. Expanding the Lessons from the Green Revolution: Reduction of government failure and market failures in the management of irrigation schemes

The Global Initiative for Smallholder Irrigation is a poverty reduction plan which targets 2 million rural poor households on 1 million hectares a year over 15 years to participate in pro-poor growth irrigation schemes. The Global Initiative will impact on the lives of 30 million and bring 15 million hectares under cultivation creating a pro-poor engine of growth which will create multiplier effects in the form of concrete benefits for millions of more people.

This programme has identified micro-technologies - small, low-cost, and affordable irrigation technologies – to drive the pro-poor growth strategy targeting small plots and landless households. The new micro-technologies which underpin the programme have already had success and these include treadle pumps, rope and washer pumps, low-cost drip and micro sprinkler, and bucket kits. The pro-poor growth strategy aims to produce high-value crops, identify and expand markets for these high-value crops, expand the local employment market in order to sustain the smallholder irrigation expansion.

These technologies have been profitably tested through Asia, Latin America and Africa: In eastern Asia (People’s Republic of China), South Asia (Bangladesh, India, and Nepal), and Latin America (Brazil, Nicaragua, and Mexico), and Africa (Kenya and Zambia).

“In recent years there has been an upsurge in the adoption of irrigation technologies for smallholders such as low-cost pumps, treadle pumps, low-cost bucket and drip lines, sustainable land management practices, supplemental irrigation, and recharge and use of groundwater and water harvesting systems” Hussain, Giordano and Hanjra (2003:65). The impact of these micro-irrigation technologies, the smallholder water and land management systems, has been impressive and this will be the future growth path of pro-
poor growth for the poorest. The large irrigation schemes which have driven the Green Revolution often do not reach the marginal areas which are better suited to micro-technologies.

Hussain, Giordano and Hanjra (2003) present the poverty reducing impacts of micro-irrigation technologies – of the kind being used to implement the Global Initiative for Smallholder Irrigation – based on a summary of issues and lessons learned from case studies undertaken on smallholder irrigation in India and Nepal (Winrock International and IDE 2001) is presented as a guide to analyzing the impact of small irrigation technologies on poverty reduction.

**Major Beneficiary**
All those who often are deep down or below the poverty line including poor rural households and landless families.

**Core Pro-Poor Intervention(s)**
Here the private sector is the key player in the promoting and marketing irrigation technologies and providing other related inputs to the poor. An initial price subsidy enables private sector entrepreneurs to mass-market these technologies among the rural poor and landless. Poor landless households use horticultural kits for income generation. The package consists of bucket kits, seed, fertilizer, pest control, and other information. Wealth creation becomes possible by growing high-value crops like papaya mixed with other vegetables, bitter gourd on the fence, and pumpkins on the roof.

**Opportunities to Serve the Poor**
All those who often are deep down or below the poverty line including poor rural households and landless families. Poorest households with land as little as 40–100 m² and water as meager as 2–10 buckets a day can earn $100 per year in net income. Virtually all rural families have access to that much land and water and therefore, virtually all rural poor stand to benefit from this pro-poor intervention. Intervention has the potential to improve health and nutrition as well as generate new income for the landless.
**Cross-cutting Issues**
- Access to low-cost drip irrigation technology
- Access to credit
- Access to inputs
- Access to markets
- Access to additional water
- Active involvement of private sector to mass-market these pro-poor technologies

**Pro-Poor Policy Implications**
- Landless families are too poor to afford even these low-cost kits; therefore, seed capital or access to credit is vital.
- There is a need to shift from subsistence to market-oriented horticultural production.

**Equity Assessment**
- Small irrigation technologies have strong potential to self-select the poor.
- The technologies offer a “win-win” gift for the poorest and landless households around the globe.

Bhattarai et al. (2002) calls for the overhauling of the management on irrigation schemes through new policies so that the initial success of the Green Revolution brought about by irrigation can be consolidated and sustained:

- **Institutional reform**
  - Improved stakeholder participation in resource use decision-making
  - Participatory irrigation management (PIM)
  - Irrigation management transfer (IMT)
  - Defining clear water rights and water entitlements
  - Self-enforcement of efficient service fee collection mechanisms

- **Technical reforms**
  - Better water control structures
  - Laser levelling
  - Lining of canals
  - Improved water storage systems
  - Conjunctive use of rainwater, canal and groundwater

- **Managerial and operational reforms**
  - Better enforcement of existing rules and regulations to minimize the lawlessness seen in irrigation commands
- Improved operation of systems
- Tailoring the irrigation operation and maintenance costs based on incremental benefits generated and level of water use system
- Targeted additional financial and credit interventions in the system considering the need of tail-end farmers for additional irrigation equipment, improving field structures and water storage.

Hussain and Hanjra (2003) argue that the anti-poverty impacts of irrigation can be improved by creating enabling environments which facilitate the functional inclusion of the poor:

- Equitable access to land
- Integrated water resource management
- Access to and adequacy of good quality surface and groundwater
- Modern production technology
- Shift to high-value market-oriented production
- Opportunities for the sale of farm outputs at low transaction costs
- Opportunities for nonfarm employment
7. Case Studies: Asia

7.1. Macro Level Analyses in India

Bhattarai and Natarayanamoorthy (2003) examine and assess the incremental impact of irrigation and other factor inputs such as literacy, roads, fertilizer and new cultivars (high yielding adoption rates –HYA) on poverty alleviation over two and a half decades. The impact of these factors on the growth of the total factor productivity is assessed. Studies have shown that the growth of all factors of productivity (TFP) is the key to the poverty reduction (Fan et al. 1999; Mellor 2001 and 2000; Desai 2002). Mellor (2001) found that agriculture growth impacts on poverty reduction. Bhattarai and Natarayanamoorthy (2003) also examined rural consumption levels. The study found:

- The regression analysis showed that from 1970-1994 that the impact of irrigation on growth has an elasticity of 0.32. “This means that one percent increase in irrigated area has brought about an increase of about 0.32 percent in the productivity of all inputs (TFP) in India.” Irrigation has the strongest influence on poverty reduction the other important influences in order of strength were found to be:
  - Rural literacy rate elasticity of 0.12%
  - HYV (new cultivars) adoption rate elasticity of 0.08%
  - Road density elasticity of 0.05%
  - Fertiliser Use elasticity of 0.03%

What these measurements are capturing is the importance of these factors in poverty reduction. “The results demonstrate that improvement in irrigation and rural literacy rate are the two most important critical factors for the recent growth as well as the overall development of agricultural sector in India.”

Rural education is important an important factor in poverty reduction because knowledge is required in the understanding and application of: new technologies, correction selection of the right cultivar, fertilisers and pesticides, sticking to a
time-table, input and produce markets and introduction of farm management techniques.

Road infrastructure is important because it creates new opportunities both for agricultural markets and off-farm economic activity.

Irrigation, new cultivars and fertiliser are important drivers of the green revolution but without rural literacy and roads the improvements would have been curtailed. Indeed, analytically one can distinguish between different factors though from green revolution perspective a holistic view needs to be taken – one which accepts that poverty reduction involves a number of interlocking factors.

- A strong inverse relationship was found between irrigation and various measures of poverty.
  - The head count index (HCI), which uses consumption expenditure measures the percentage of the population below the poverty line, has declined over three decades.
  - Poverty gap index (PGI) has declined at a faster rate over the same period.
  - The consumption model showed that the increasing rate of per capita consumption of the rural population. There is a general rise in the standards of living.

The evidence from this case study suggests that “the future strategy of rural poverty reduction in rural India will largely depend on how efficiently the irrigation sector is managed and how effectively irrigation access is provided to a large number of farmers in the regions that have still not benefited form the green revolution of the 1970s and 1980s” (Bhattarai and Natarayanamoorthy, 2003: 7).

The evidence also suggests that “Improvements in irrigation and rural literacy rate are the two most important critical factors for the recent growth as well as the over all development of the agricultural sector in India. The large impact of the
rural literacy rate clearly illustrates the important role of human capital development in the growth of agricultural productivity.” (Bhattarai and Natarayanamoorthy, 2003: 5).

7.2. Case Study: Gujarat, India

Shah and Singh (2005) explore the interplay between irrigation development and rural poverty in 177 predominantly rural talukas (blocks) of Gurjarat using data from 1997. The taluka typically has 80 – 130 villages, a population between 150 000 and 300 000, and approximately 50 000 to 150 000 hectares of farm land. Shah and Singh (2005) note that: “Gujarat presents proof that the “trickle down” effect of economic growth does not happen in a hurry. According to the BPL (Below Poverty Line) census, one-third of households were below poverty line in the state.” The study found that:

- “Degree of urbanization, farm land availability and its productivity, farm income per rural person, distance from the Golden Corridor, and the number of primary classes per village are some significant determinants of the variations in the BPL ratio across Gujarat’s 177 rural talukas.” The reduction in poverty – the poverty reduction elasticity was found to be significant with following variables:
  
  ✓ Gross farm income per rural person – elasticity of - 0.10. Irrigation development because its impact on gross farm income per rural person (FIRP) has a small but significant impact on poverty reduction. “The elasticity value of -0.10 for FIRP indicates that a 10% increase in the average FIRP of the state can reduce the BPL ratio by 1%.” FIRP in turn is overwhelmingly influenced by the land/man ratio (LMR) and land use intensity (LUI); and LUI, in turn is hugely influenced by irrigation density (that is, percent of net sown area that is irrigated).
  
  ✓ Rural electrification – elasticity of 0.29. Yet as most talukas are electrified the future potential of this variable is very small.
Number of primary class-rooms/villages – elasticity of -0.197. Targeting school infrastructure can assist in poverty reduction. Though Shah and Singh note that “In the case of primary education infrastructure, the direction of causality is open question; it is equally possible to hypothesize that primary education infrastructure tends to get better as a taluka climbs the ladder of economic development and enjoys reduced levels of the BPL ratio.

Urban population ratio – elasticity of -0.196. Urbanization and industrialization have potential to dramatically reduce poverty.

Distance from the Golden Corridor – elasticity of -1.143.

Over 50 of the 177 talukas have more than 50 percent of sown area under irrigation:

- Only 3 talukas have a BPL ratio above 50 percent.
- Talukas with high irrigation ratio tend to have low BPL ratio. (This supports the importance of irrigation in poverty reduction).
- The reverse of the above point holds: Talukas with low irrigation ratio tend to have high BPL ration. (This supports the importance of irrigation in poverty reduction).
- Yet the largest numbers of Talukas have lower irrigation as well as low BPL ratio. This pattern “suggests that irrigation is not the only route out to reducing rural poverty.”

Impact of canal irrigation on FIRP and rural poverty is greater than groundwater irrigation. This differentiation is the result of:

- Canal irrigation is very concentrated in a few areas and is used on 5.85 percent of the net sown area;
- Groundwater irrigation is dispersed throughout Gujarat and is used on 25.7 percent of the net sown area

There is an inverse relationship between rural poverty and land productivity (measured as value of output per hectare)
The data indicates that increased land intensity is the manner in which irrigation impacts on farm income and rural poverty.

Such areas where the benefits of irrigation are visible act as magnets: “Irrigation benefits within command areas may approach a zero-sum game over the long run because areas with intensive irrigation development act as magnets that attract poverty from their surround” (Shah and Singh, 2005: 5).

Over a period of time population rises faster (or declines at a slower rate) on high intensive irrigated areas compared to dry land areas.

The evidence from this case study suggests that “irrigation is a sufficient condition for poverty reduction though not a necessary one” (Shah and Singh, 2002:4). The case study demonstrates that from the viewpoint of the design of a poverty reduction program, “two variables hold appeal: investment in primary schooling infrastructure and improving gross farm income per rural person through increasing land productivity” (Shah and Singh, 2002:5). Further the evidence suggests that there is an inverse relationship between rural poverty and land productivity (measured as value of output per hectare).

7.3. Case Study: Uda Walawe Left Bank Irrigation System, Sri Lanka

Hussain, Jehangior, and Ashfaq (2002) assessed the impact of improved household access to large-scale surface irrigation, through upstream rehabilitation of infrastructure and downstream development of new infrastructure, on poverty reduction in the Uda Walawe Left Bank Irrigation System. The study site is in the Walawe Ganga basin in a dry zone which is part of a resettlement scheme. Some 200 000 families were resettled from the overpopulated wetter zone by 1998 on 328 000 ha of land of the dry zone. The irrigation is on 12 000 ha and each settler was given 1 – 2 ha of land. There are approximately 17 000 families in the study site. The average cropping intensity is 200 percent. Crops are rice, bananas, chilies and onions.
Hussain, Jehangior, and Ashfaq (2002) maintain that the irrigation scheme is a good example of the use of irrigation in poverty reduction. The Walawe Left Bank Irrigation System targeted the poor and all irrigation infrastructures were improved regardless of land size. The study contrasted the difference between well and less developed/improved irrigation and between those with and without irrigation. The results demonstrated:

- Income and expenditure are higher in for those who have access to irrigation than those without. Household expenditure is 24 percent higher in households with irrigation than those without. These results are based on the following irrigation induced improvements:
  - Doubling cropping each year plus higher cropping intensity
  - Improved crop yield and overall farm production
  - Higher wages and levels of employment. Wage rates without irrigation are $1.92 (173 rupees) per day and with irrigation $2.22 (200 rupees) per day.
  - Poverty, measured in monetary and non-monetary terms, is lowest in households with access to irrigation and conversely highest in areas without irrigation where there is the highest chronic poverty. High chronic poverty is also found in those households without a farm.
  - Food security and balanced diet also improve on irrigation land.

- Income, expenditure and asset comparison between all irrigated and all rain-fed smallholder households measured in Rupees (R):

<table>
<thead>
<tr>
<th></th>
<th>All Irrigated</th>
<th>All Rain-fed</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Rupees</td>
<td>Rupees</td>
</tr>
<tr>
<td>Household Annual Expenditure</td>
<td>71,473</td>
<td>52,898</td>
</tr>
<tr>
<td>Household Annual Income</td>
<td>97,467</td>
<td>82,517</td>
</tr>
<tr>
<td>Value of Household Assets</td>
<td>21,418</td>
<td>10,436</td>
</tr>
<tr>
<td>Value of Household</td>
<td>21,002</td>
<td>7,309</td>
</tr>
</tbody>
</table>
Income, expenditure and asset comparison between farm and non-farm households:

<table>
<thead>
<tr>
<th></th>
<th>Farm Rupees</th>
<th>Non-farm Rupees</th>
</tr>
</thead>
<tbody>
<tr>
<td>Household Annual Expenditure</td>
<td>69,856</td>
<td>57,341</td>
</tr>
<tr>
<td>Household Annual Income</td>
<td>99,814</td>
<td>66,377</td>
</tr>
<tr>
<td>Value of Household Assets</td>
<td>20,165</td>
<td>14,795</td>
</tr>
<tr>
<td>Value of Household Agricultural Assets</td>
<td>19,811</td>
<td>10,575</td>
</tr>
</tbody>
</table>

The incidence of chronic poverty is only 6.5% among farm households compared to 64.2% among non-farm households.

- Production outputs in irrigated areas provide opportunities for those without irrigation.
- Higher production permits households higher consumption.
- Upstream infrastructure improvements save water for downstream use – this helps with the equity in distribution of water. Downstream users tend to have less water.

The evidence from this case study suggests that the incidence of poverty is lowest where there are targeted irrigation schemes for the poor.

7.4. Case Study: Mandi Bahauddin and Gujrat, Pakistan

Hussain, Marikar and Thrikawala (2002) studied the Mandi Bahauddin and Gujrat districts which have over 3 million people half a million hectares of land. The area is in the Upper Indus Basin. Irrigation has been in the area during the colonial period. New
dams and canals began in the 1960s to expand the network of irrigation infrastructure. In the late 1970s on-farm water management was introduced to improve water use efficiency and thereby improve access to water. It is estimated that 40-60% of the water is lost on the farms. In the mid-90s on-farm water management program was launched with the particular sites of this study. Settlement is well established and on private land. The major crops are wheat, rice, cotton, and sugarcane. The study demonstrated:

- Access to irrigation infrastructure leads to poverty reduction. Improvements in irrigation infrastructure, by increasing the availability of water, leading to:
  - Higher cropping intensity of 120%-150% (which is below average for Asia)
  - Higher crop productivity – an increase between 5%-25%.
  - Improved crop incomes – an increase between 12%-25%.

- The irrigation improvements are only marginal in the Mandi Bahauddin and Gujrat districts of the Upper Indus Basin. The incidence of poverty is only 0.8% less where the irrigation has been improved compared to areas without irrigation. Several factors explain this marginal impact:
  - Unequal distribution of land – those with large land holdings benefit more from the irrigation than smallholders and the landless.
  - Poor governance of the water system, including:
    - Poor maintenance of old infrastructure
    - Poor maintenance of new infrastructure
    - Unreliable water supply and no management planning
    - Tolerance of water theft

- Understandably the impact of irrigation on poverty reduction is highest where there is fairly equitable distribution of landholdings.
  - Thus for poverty reduction the poor need to be targeted
  - Skewed land distribution will lead to skewed benefits from irrigation
  - Access to irrigation is a key to poverty reduction
The reasons for the failure of irrigation to impact on poverty reduction in the Mandi Bahauddin and Gujrat districts of the Upper Indus Basin are:

- The disproportionate distribution of land
- The high and increase rate of landlessness
- Improvements in irrigation took place in areas where there were large landholdings
- Irrigation infrastructure was uniformly improved. Although the study is silent on where the improvements took place given the other measurements one can hypothesize that the areas in which improvements took place where further biased towards the large landholdings in those areas
- There has been an increase in crop production and income. These benefits because of the land distribution accrued to large land owners
- The problem from a pro-poor growth perspective is that irrigation infrastructure improvements did not target the poor

The evidence from this case study suggests both the importance of targeting the poor in pro-poor growth strategies and the importance of water management and without these as in this case study irrigation will only have a marginal impact on poverty reduction.

7.5. Case Study: Bangladesh, China (PRC), India, Indonesia, Pakistan and Viet Nam

International Water Management Institute conducted this study into pro-poor growth on 19 irrigation sites in Bangladesh, China (PRC), India, Indonesia, Pakistan and Viet Nam (reported in Hussain, Giordano and Hanjra, 2004: 61-64). This study explores a number of management, institutional and distribution issues. The hypotheses tested in the study include:
“Canal reaches receiving less irrigation water have lower productivity and a higher incidence of poverty.

“Under existing conditions, small, marginal and poor farmers receive less benefit from irrigation than large and non-poor farmers.

“The greater the degree of O & M (operations and maintenance) cost recovery, the better is the performance of irrigation management.

“Participatory irrigation management (PIM) and/or irrigation management transfer (IMT) leads to improved irrigation systems performance, which in turn reduces poverty.

“An absence of clearly defined water allocation and distribution procedures, and absence of effective and clear water rights (formal and informal) adversely affects the poor more than the non-poor.

There is scope for improving performance of irrigation systems under existing conditions, with effective and improved institutional arrangements.”

The study found that:

- The frequency of rural poverty is highest in Pakistan and Bangladesh and lowest in China (PRC).
  - The incidence of poverty is decreasing over time except in Pakistan

- Strong interconnections between agricultural water and poverty reduction
  - There are still large numbers of poor in most irrigated agricultural systems

- Inequity in distribution and water is uneven in South Asia:
  - Lowest in China (PRC) and Bangladesh
  - Highest in Pakistan

- Rural poverty is concentrated among:
  - Landless households dependant on agriculture for wages (with little opportunity for non-farm labour)
  - The smaller landholders (size is a determinant of water and non-water related issues such as inputs, technology and information)

- Landlessness is increasing with population increases:
  - Landless rate is rising the faster in Pakistan
Without non-agriculture/industrial sector of development Pakistan requires fundamental land reform in order to impact on poverty reduction.

Improvements in management of water and irrigation systems would provide benefits to poor smallholders and indirect benefits through increased employment opportunities to landless poor.

China’s massive urbanization is effectively absorbing the landless households at a faster rate than other countries.

- In China, Indonesia and Viet Nam have fairly high cropping intensities (200%-300%) on smaller landholdings there is scope to:
  - Improve crop diversification to increase economic productivity
  - Create value add to agriculture goods to increase economic productivity

- In South Asia such as India and Pakistan crop productivity levels are much lower than in East and South East Asia:
  - Improve water and land productivity through water and non-water interventions

- There is inequity in water distribution across head, middle and tail reaches of the 19 irrigation system studied:
  - Even in China and Viet Nam where there is the least inequity in land distribution there is water inequity.
  - Inequity in water has a direct impact on productivity with those smallholders downstream having the lowest productivity.
  - In Pakistan wheat productivity varied from a high of 1,689 to 3,459 kg/ha at the head to a low of 1,236-2,965 kg/ha at the tail. Poverty at the tail is higher than poverty at the head.

The evidence from this case study (Hussain, Giordano and Hanjra, 2004) suggests that:

- “The causes of poverty are complex and multidimensional… a considerable part of rural poverty can be reduced through improved access to water with well-planned and targeted interventions.”
Reforms are necessary for poverty reduction in three major areas: “Legal and regulatory measures, participatory management, and finance…confidence, awareness, and empowerment of farmers have improved through meetings and dialogues over water-related issues.”

“PIM or IMT through the formation of water users associations is still in the experimental stage…either IMT and/or PIM has the potential to create a conducive environment for improving performance of irrigation, including equity in distribution of water and improved access to water by the poor.”

7.6. Evidence from 14 Countries: Bangladesh, Bolivia, Brazil, Burkina Faso, el Salvador, Ghana, India, Indonesia, Romania, Senegal, Tunisia, Uganda, Vietnam, and Zambia

This case study is included to ensure that one does not overlook the macro economic elements when one is consider pro-poor growth.

Economic data analysis of 14 countries (Bangladesh, Bolivia, Brazil, Burkina Faso, el Salvador, Ghana, India, Indonesia, Romania, Senegal, Tunisia, Uganda, Vietnam, and Zambia) in the World Bank (2005) study corroborates that velocity of national economic growth is the fundamental factor that influences the speed of poverty reduction. These country studies illustrate the connection between overall economic growth and decline in poverty.

Bangladesh, Bolivia, Brazil, Burkina Faso, el Salvador, Ghana, India, Senegal, Uganda, and Vietnam experienced solid economic growth in the 90s and in these countries the incidence of poverty declined. In contrast, Indonesia, Romania, and Zambia experience economic stagnation (little or no growth) and in these three countries the incidence of poverty rose. It was found that for the 11 countries that on average for every increase in GDP per capita of 1% in the between 1993 and 2002 (the period of the study) there was
1.7% reduction in poverty. The median GDP growth rate for all 14 countries was 2.4% per annum between 1996 and 2003.

In Vietnam the reduction in poverty was dramatic; poverty declined by 7.8% per annum – this cut the poverty rate in half from 58% to 29%. Other countries, (el Salvador, Ghana, India and Tunisia), also experienced marked declines in poverty of 3% - 6% per annum, on the back of economic growth.

In the growing countries rural areas home to the majority of the poor households displayed an absolute decline in poverty. Countries with a high growth rate showed a more marked decline in urban poverty. Vietnam’s urban poverty rate declined by 11% at a faster rate than is rural poverty reduction. What is of interest is that Vietnam’s economic growth was stimulated by what the World Bank terms “massive increases in infrastructure” as well as other factors played an important role in this growth. In Burkina Faso, Uganda and Ghana export driven agricultural growth of the commercial crops of coffee, cotton and cocoa respectively resulted in the largest sub-Sahara poverty reduction.

A variety of macro factors led to economic growth:

- Exchange rates
- Trade liberalization
- Labour reforms
- Export incentives
- Market reforms
- Structural and sectoral policies
- High levels of infrastructure spending
- Rising capital inflows form foreign direct investment
- Remittances

“Greater poverty reduction was observed where policies were in place to enhance the capacity of poor people to participate in growth. Several of these policies are the same as those required to foster higher growth. Several of these policies are the same as those
required to foster higher growth” (World Bank, 2005: 13). Examples are in Bangladesh where the importing of agriculture inputs and new pump technology was permitted. Labour market reforms permitting the expansion of employment opportunities for semiskilled and unskilled labour in Bangladesh, el Salvador, Tunisia and Vietnam.

Although primary school education is in place in the 14 countries secondary enrolments were not improving. This lack of secondary education will constrain the development of non-agricultural activities.

Infrastructure growth, in particular of roads and electricity, linking rural areas to towns and cities connected with non-agricultural growth led to increasing informal sector employment in Bangladesh, India, Vietnam and el Salvador. In contrast the lack of infrastructure in Africa continued to constrain access to the wider economy thereby constraining growth and limiting the options of the rural poor to traditional ways of life.

The evidence from this case study (World Bank: 2005) suggests that:

- “Policymakers, who seek to accelerate growth in the incomes of poor people, and thus reduce overall poverty, would be well advised to implement policies that enable their countries to achieve a higher rate of overall growth.”

- “Evidence from the 14 countries in this study confirms that the pace of overall economic growth is the main factor that determines how quickly poverty declines. A successful pro-poor growth strategy should have, at its core, measures to achieve sustained and rapid economic growth.”

- “Greater poverty reduction was observed where policies were in place to enhance the capacity of poor people to participate in growth.”

- Depending on the circumstances different strategies are required. There is no single solution. It is possible to identify “several policies that can help poor households take advantage of growth opportunities. The analysis also
underscores that the priority-setting and phasing of these policies will differ across countries – according to their conditions.”
8. Overview of Infrastructure and Pro-Poor Growth in Sub-Saharan Africa

In 2003/4, at the mid-point in the 25 years of the Millennium Declaration (1990-2015) only six counties were on target for achieving the first goal of halving the proportion of people living below $1 per day. Interestingly none of these six countries (Algeria, Egypt, Libya, Morocco, Tunisia and Mauritius) are sub-Saharan countries. While the incidence of poverty has fallen in Asia, in Africa poverty according to the World Bank (2004a) rose from 41 percent to 46 percent in 2001.

Chen and Ravallion (2004) demonstrate that from 1981 to 2001 the proportion of Asians living in poverty – measured by those living on less than a dollar a day - fell dramatically. On the other hand poverty has increased in Africa and in absolute numbers the increase is dramatic and discouraging from 163 million in 1981 to 31 million in 2001.

At decolonization in the late 50s and early 60s Africa inherited public sector monopolies which ran the national infrastructure industries. This model of infrastructure was found not too meet the needs of the emerging states wishing to increase their economic output. These problems according to the World Bank (2004b) have arisen from: underinvestment, in large part caused by under-pricing; low productivity; poor service quality; long queues and large partitions of the population without access to basic services; lack of transparency; and damaging political interference in the operations of these infrastructure entities.

During 1970s and 1980s there was a process of commercialization of these state-owned enterprises (SOEs) when there were attempts to address these issues and improve performance and output of the SOEs without complete privatization. This process failed leading to a reassessment of public policy on infrastructure. The causes of poor performance and failure were (Nellis, 2005: 8-9):

- Poor initial investment decisions
- Inadequate capitalization: The lack of initial and working capital forced SOEs to rely on debt finance. This finance was expensive and harmed the ability to
expand. The SOEs sunk into deeper into debt. In the 1980s 80 percent of Senegal’s commercial bank credit was channeled to the SOEs drying up the credit market for private businesses.

- **Below-cost pricing:** In order to help the poor most African governments set tariffs below cost-covering levels (or they failed to raise tariffs as costs increased). The infrastructure industry was starved of capital need for growth.

- **Collection deficiencies:** African infrastructure SOEs collection failures were too common – especially when the client was government. In order to cover the lack of funds to government many SOEs ignored the state-owned bank debt obligations and failed to pay taxes. Thus financial discipline collapsed.

- **Poor reporting systems:** Financial reporting and monitoring systems were poor or non-existent. In Tanzania 1/3 of the 425 SOEs failed to produce basic accounts in 1988. Only 18 percent – 84 SOCs – could be considered to be profitable (Nellis: 1988)

- **Deficient Boards of Directors:** Board membership was often used to reward political supporters, retiring generals and MPs. In addition, board members were also middle management civil servants who defended the interests of the ministry rather than the SOEs. Few board members had any expert knowledge of the particular SOE.

These performance shortcomings led to financial failure in the 1980s. It was recognized that infrastructure had an important, if not central, role to play in development and economic growth and that the funding, management, expansion, maintenance of the SOEs needed to be overhauled. Far-reaching reforms were introduced to remodel the infrastructure industry – particular privatization and market liberalization was promoted. It was hoped that privatization would promote “operating efficiency, restore financial viability of virtually bankrupt state-owned network utilities, especially through the promotion of more rational pricing policies, that they would improve served quality and eliminate service backlogs, introduce greater transparency in the operations of these industries, and also insulate the operating infrastructure entities from damaging political interference” Jerome and Ariyo (2004:3).
8.1. Privatized Infrastructure Linkages With Pro-Poor Growth

Between 1990 -1997 governments around the world adopted strategies to encourage the private sector to participation in the investment of infrastructure. For governments the private sector held out hope to bring in new innovations, introduce cost saving solutions, raise quality standards and achieve sustainable self-funding services. Such private sector involved has been tied to the overall success of the world’s markets and growth rates – any economic slowdown is immediately reflected in declines in investments in infrastructure (World Bank, 2003).

The reform of infrastructure policies and procedures to improve quality service delivery can be used to simulate pro-poor growth. As infrastructure provides an important framework for the economy the privatization of infrastructure needs to ensure its proper function while generating positive impacts for the poor. The key to a pro-poor growth strategy is to have a regulatory framework to guide both the economic and physical impacts of the infrastructure. This privatization is seen as not being pro-poor as privatization, critics argue, leads to tariff hikes. In addition there is a tendency for market forces to drive infrastructure industry to withdraw from marginal markets (poor urban neighbourhoods and rural areas where the distances increase the cost of the infrastructure) and with its profit driven motive focus on the more profitable market segments. Hence, for critics privatization curtails the potential developmental thrust of infrastructure (Clarke, George and Wallsten: 2003).

The major impacts of infrastructure on pro-poor growth can be divided between the macroeconomic and microeconomic linkages. Most of the macroeconomic linkages have an indirect impact on pro-poor growth whereas the microeconomic linkages have a direct impact on pro-poor growth.
8.1.1. Macroeconomic Linkages to Pro-Poor Growth

The impact of infrastructure reform – privatization - on macroeconomic can increase the investments in and productivity of infrastructure and hence the overall level productivity of infrastructure. Aschauer (1989) was the first to measure the impact of infrastructure on economic growth by demonstrating that there was a significant link in the US between the two.

Infrastructure privatization can raise employment levels as efficiency and expansion takes place, yet as the SOEs tended to have bloated payrolls this outcome is not likely in the short-term. This longer term effect of the privatization of infrastructure increasing economic growth and hence employment has been found to hold for Argentine by Benitez, Chisari and Estache (2000).

Infrastructure privatization eliminates unproductive subsidies and generates revenues and so can have an impact on public expenditure.

For Africa, “The number of rigorous studies remains low; we do not possess sufficient information to reach a definitive conclusion regarding PPI’s effects” (Nellis: 2005). The studies in Latin America emphasize the positive impact of infrastructure on growth (Baffes and Shah: 1998), (Chisari, Estache, and Romero: 1999), (Navajas: 2000) and (Alexander and Estache: 2000).

8.1.2. Microeconomic Linkages to Pro-Poor Growth

Privatization of infrastructure faces two challenges that of access (connection costs) and affordability (rising prices, changing tariff structures, and rising quality standards).

The challenge of customer access to the privatized infrastructure is the initial high connection fee. In contrast, “The investment costs of state-owned enterprises are typically
subsidized, and they can therefore afford to charge very little connection costs, if at all, for network expansion. To the contrary, privately operated utilities that have no access to subsidized funds often charge substantial one-time connection fees or charges to cover the costs of network expansion. High connection charges therefore often serve as an obstacle to service expansion by private providers.” Jerome and Ariyo (2004:13).

Affordability is a similar dilemma because in order to offer a quality service or improve on the old SOEs service a private infrastructure service must raise fees. Yet such action will be detrimental to the well-being of the poor.

8.2. Private Participation in Infrastructure in Africa

At the same time as the poor record of African government interventions became clear there was a shift in global economic thinking from the Keynesian position of an interventionist state to the Hayekian position that market failure was a lesser problem than government failure (Yergin and Stanislaw: 1998). The markets were about to be unleashed on Africa.

The lessons of early privatization were several (Nellis, 2005: 17-18):

- Liquidations, especially of defunct, non-functioning SOEs, proved comparatively easy to enact;
- SSA governments negotiated hard to buy time before a privatization decision was implemented; e.g., by agreeing to studies, preparation periods, the creation and staffing of privatization agencies, etc., all of which, it was plausibly argued, had to precede privatization, and all of which took more time to execute than had been planned;
- Management contracts and leases were easier to implement than outright sales;
- Joint ventures and sales of minority stakes were more readily accepted and could be put in place faster than transfers of a majority of equity;
- Sales to non-nationals, or even to citizens of non-African ethnicity, consistently raised difficulties and moved slowly, if at all; and
In this period, the problems of infrastructure SOEs were addressed through reform, not privatization.

Data from the World Bank’s Private Participation in Infrastructure (PPI) will be used to evaluate the extent of PPI participation in Africa. The process of privatization started slowly. From 1984 -89, only 26 developing countries – with only one or two from Africa – awarded 72 PPI contracts valued at $19 billion. In contrast the years from 1990-2003 saw an upsurge of 140 developing countries, including almost all of Africa award 2,731 PPI contracts valued at $800 billion. There were only 224 PPI contracts awarded in Sub-Saharan Africa valued at $33.4 billion during this period; this figure of $33.4 billion accounts for 40 percent of all infrastructure investment. Only about four percent of the total PPI invested ($800 billion) from 1990 – 2003 was invested in Africa and half of this (two percent of total) was invested in South Africa.

See Table 1: PPI Projects by Region and Investment Amounts 1990-2003 below.

### TABLE 1

**PPI PROJECTS BY REGION & INVESTMENT AMOUNTS, 1990-2003**

<table>
<thead>
<tr>
<th>REGION</th>
<th>COUNTRIES</th>
<th>PROJECTS</th>
<th>INVESTMENTS $ (in US billions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>E. Asia/Pacific</td>
<td>18</td>
<td>701</td>
<td>187.7</td>
</tr>
<tr>
<td>Europe/Cent. Asia</td>
<td>26</td>
<td>524</td>
<td>118.6</td>
</tr>
<tr>
<td>Lat. America/Carib.</td>
<td>28</td>
<td>1008</td>
<td>378.8</td>
</tr>
<tr>
<td>Mid. East/No. Africa</td>
<td>14</td>
<td>76</td>
<td>38.3</td>
</tr>
<tr>
<td>South Asia</td>
<td>6</td>
<td>198</td>
<td>45.0</td>
</tr>
<tr>
<td>Africa (South Africa alone)</td>
<td>47</td>
<td>224 (25)</td>
<td>33.4 (16.0)</td>
</tr>
<tr>
<td><strong>Totals</strong></td>
<td><strong>139</strong></td>
<td><strong>2,731</strong></td>
<td><strong>801.0</strong></td>
</tr>
</tbody>
</table>

*Source:* Calculated from World Bank, Private Participation in Infrastructure (PPI) database.

Approximately half of the PPIs were ownership or management by private sector; the other half was “Greenfield” (new private) investments to add capacity. PPI investments rose from $5 billion (end of 1980s) to $30 billion (1992) to a peak of $120 billion (1997).
In 2005 the World Bank (2005:13) noted that the sectors of railways, airlines, petroleum, water, fixed-line telephones in half of Africa’s countries were still SOEs. For electricity generation, transmission and distribution in two-thirds of Africa’s countries were still SOEs. Telecommunications account for two thirds of all PPI – South Africa receives more than half of these awards. Following telecommunications in terms of size of the awards are energy, transport and a very small investment in water and sewerage. See Table 2: PPI in S-S Africa, 1990-2003, by Sector and Investment Amount (US $ billions), below.

**TABLE 2:**

**PPI in S-S AFRICA, 1990-2003, by SECTOR & INVESTMENT AMOUNT (US $ billions)**

<table>
<thead>
<tr>
<th>SECTOR</th>
<th>AMOUNT</th>
<th>PERCENTAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy</td>
<td>7,375</td>
<td>22.1</td>
</tr>
<tr>
<td>Telecommunications</td>
<td>21,724</td>
<td>65.0</td>
</tr>
<tr>
<td>Transport</td>
<td>4,081</td>
<td>12.2</td>
</tr>
<tr>
<td>Water &amp; Sewerage</td>
<td>230</td>
<td>0.7</td>
</tr>
<tr>
<td>TOTAL</td>
<td>33,410</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Source: Calculated from World Bank PPI Database.

Investment in PPI tends to vary by sector. In telecommunications greenfield investments dominate – indicating that it is seen as having huge potential. Greenfield investments are also important in energy but not to the same degree. In contrast concessions are important in transport and management- and lease-contracts (MC/LC) dominate the water and sewerage sector. Divestiture, where the private sector controls the major equity, is not applied very often in Africa. See Table 3: PPI in S-S Africa 1990-2003, by sector and Type of PPI Operation, below. “The domestic private sector in most Sub-Saharan African countries has been an important provider of infrastructure services through private wells, power generation plants, and informal, small-scale suppliers. The database (World Bank) has not tracked such private activity, mainly because these projects are too small” Jerome and Ariyo (2004:19).
TABLE 3:
PPI in S-S AFRICA 1990-2003, by SECTOR & TYPE of PPI OPERATION

<table>
<thead>
<tr>
<th>SECTOR</th>
<th>GREENFIELD</th>
<th>DIVESTITURE</th>
<th>CONCESSION</th>
<th>MC/LC*</th>
<th>TOTALS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy</td>
<td>22 ops, 44.9 %</td>
<td>5 ops, 10.2 %</td>
<td>12 ops, 24.5 %</td>
<td>10 ops, 20.4 %</td>
<td>49, 100 %</td>
</tr>
<tr>
<td>Telecomm</td>
<td>95 ops, 84.8 %</td>
<td>15 ops, 13.4 %</td>
<td>0 ops, 0 %</td>
<td>2 ops, 1.8 %</td>
<td>112, 100 %</td>
</tr>
<tr>
<td>Transport</td>
<td>13 ops, 26.5 %</td>
<td>3 ops, 6.1 %</td>
<td>22 ops, 44.9 %</td>
<td>11 ops, 22.4 %</td>
<td>49, 100 %</td>
</tr>
<tr>
<td>Water &amp; Sewerage</td>
<td>2 ops, 14.3 %</td>
<td>0 ops, 0 %</td>
<td>2 ops, 14.3 %</td>
<td>10 ops, 71.4 %</td>
<td>14, 100 %</td>
</tr>
<tr>
<td>Total # PPI by type</td>
<td>132, 58.9 %</td>
<td>23, 10.3 %</td>
<td>36, 16.1 %</td>
<td>33, 14.7 %</td>
<td>224</td>
</tr>
</tbody>
</table>

Source: Calculated from World Bank PPI Database. (* MC/LC = managements contracts and/or lease contracts.)

The PPI has impacted on Sub-Saharan Africa but to a lesser extent than elsewhere in the world. As noted above South Africa receives the largest portion of any other African state of the PPI investment. A majority of African states have only concluded one or two agreements. The top five African receivers of PPI investment account for 71.7 percent of the total investment and South Africa received fewer than 50 percent (47.9 percent) of the total investment. See Table 4: Top Five Receivers of PPI Investment in S-S Africa, 1990-2003.

TABLE 4:
TOP FIVE RECEIVERS OF PPI INVESTMENT IN S-S AFRICA, 1990-2003

<table>
<thead>
<tr>
<th>COUNTRY</th>
<th>PPI INVESTMENT, $ BNs</th>
<th>% TOTAL PPI INVESTMENT IN SSA</th>
</tr>
</thead>
<tbody>
<tr>
<td>South Africa</td>
<td>16.0</td>
<td>47.9</td>
</tr>
<tr>
<td>Nigeria</td>
<td>3.1</td>
<td>9.3</td>
</tr>
<tr>
<td>Mozambique</td>
<td>2.5</td>
<td>7.5</td>
</tr>
<tr>
<td>Cote d’Ivoire</td>
<td>1.4</td>
<td>4.2</td>
</tr>
<tr>
<td>Tanzania</td>
<td>0.9</td>
<td>2.8</td>
</tr>
<tr>
<td>Total</td>
<td>23.9</td>
<td>71.7</td>
</tr>
</tbody>
</table>

Source: Calculated from World Bank PPI Database.
8.3. Impact of Private Participation in Infrastructure in Africa

Overall the number of rigorous studies on PPI investments remains low yet a number of discernable trends can be identified. The technical/economic assessments conclude that privatization has been beneficial. By way of contrast the literature on privatization of SOEs in manufacturing, commercial and industry shows a superior performance all round Nellis (2005). Campbell, White and Bhatia (1998:125) noted that “Monitoring and evaluation have largely been ignored; hence the paucity of data on – and the difficulty of judging – the progress and impact of privatization to date.

On average private firms have tended to:

- Improve profitability
- Improve efficiency (measured by labour productivity)
- Improve returns on investments to shareholders

The privatizations of the SOEs show:

- Improved finances
- Better quality of service
- A larger expansion (quantity) of network service
- A mixed record with regard to pricing (declines in costs of telephone service and increases in transport, water and sewerage)
- A decline in the number of employees (often cross-linked to the increase in productivity)
- In some cases poor outcomes, investor withdrawal and public anger towards the PPI
- The best results in high or middle income countries

8.3.1. PPI and Telecommunications
In a detailed study it was found that Cote d’Ivoire, Ghana, Senegal and Uganda had positive outcomes in economic, financial, quality, quantity and distribution after PPI in telecommunications (Gokgur, 2004:20-22).

Thirty countries half in Sub-Sahara Africa and half in Latin America were examined by Wallsten (1999) who found that ownership “does not appear to generate many benefits”.

### 8.3.2. PPI and Water

Menard and Clarke (2002) concluded that PPI improved the performance of infrastructure service delivery in Sub-Saharan African countries. Yet they found that the gains did not match the expectations of the government, the investor and the World Bank. Government consumers of water in Guinea, Cote d’Ivoire and Senegal did not improve there previous poor payment record to the new PPI businesses.

Kirkpatrick, et al (2004) assessed the impact of PPIs on service delivery in water services in Africa. There are only eight countries with nine PPI utilities. The findings indicate that the PPIs performance in contrast to SOEs is better.

### 8.3.3. PPI and Energy

Gokgur (2004:18) points out that “Cote d’Ivoire is the only country where efficiency gains after private participation in electricity were measured and reported”.

The World Bank/PPIAF (2002a) found consistent improvement in the electricity service in Gabon – here the government paid its bills a fact which the World Bank believes underpinned the PPI success. In Namibia the World Bank/PPIAF (2002b) found technical and financial gains of a private electricity operator impressive: the number of customers were doubled in rural areas, kept employment the same, reduced tariffs for the poorest and reduced system losses for 47 to 7 percent. Yet for a variety of reasons the contract was not renewed.
Africa has yet to seriously reform its power sector which is known for its power blackouts. Some African power systems lose 30 percent of their power from distribution (international benchmark 10 -12%). The African “power sector utilities are characterized by unreliability of power supply; low capacity utilization and availability factor; deficient maintenance; poor procurement of spare parts; and, high transmission and distribution losses . . . (and ) mismanagement” Jerome and Ariyo (2004:28). It is this situation that the PPIs are meant to remedy.

8.3.4. PPI and the future

Over the next decade it will become clearer whether PPI provide an overall improvement for Africa infrastructure it is still to early to conclusively conclude either way. More case studies are needed on pro-poor growth so that the impact on poverty reduction may be gauged. Yet if Latin America and Asia continue to grow their economies and reduce poverty the next round of case studies may well include the pervasive impact of cultural values on institutions and management practices (administration and finance) and the general attitude of Africans towards development.

Nellis (2005) argues that in addition to whether the PPI are succeeding or not there is a problem in the successful cases between the benefits to consumer and the costs to a few. Nellis (2005:30) says, “In Africa, as elsewhere, the basic political conundrum of privatization (not just in infrastructure is as follows: PPI’s benefits for consumers at large tend to be dispersed among amorphous, unorganized segments of the public. The benefits are small for each affected customer…A sustained decline by 5 – 10% in average electricity tariffs, for example, is in aggregate as substantial and worthwhile gain for any economy…But gains of this nature do not move masses of consumers to mobilize politically in favor of the policy, much less the regime…Modest average real price declines thrill economists, but not voters… The costs of privatization, in contrast, are concentrated among a visible, vocal and urbanized few – dismissed workers, represented by powerful public sector unions; bureaucrats in supervisory ministries that lose their
authority, perks and perhaps even *raison d’etre*; managers and board members of SOEs removed pre- or post-sale, upper-income consumers about to lose a service long-furnished at a subsidized price. Though the sum of their welfare losses are, presumably, much less than the aggregate gain, these actors possess “voice” and access to power; they can and do make their needs and views known.”

Nellis’ point applies neatly to the problem of assessing pro-poor growth. There can be benefits that accrue but they may not be politically or indeed socially acknowledged. In that case who knows about the benefits – the researcher of a particular case study? The overall decline of incomes in South Africa’s traditional areas, since 1994, to levels below those paid under apartheid is a large political case in point on how to interpret change free of the values of the powerful elites. It is almost impossible to break out of this magic circle.
9. Case Studies: Africa

9.1. Irrigation Reform in Malawi: Domasi and Likangala Irrigation Schemes

Privatization reform is sweeping through Africa driven by the neo-liberal theories on economics, human nature and development, which accentuate private-sector initiatives, replacing state funded infrastructure by the private sector and new community-based institutions. Resources which were under customary law and control (tenure) are being privatized. This case study on irrigation reform in Malawi offers insight into the impact of this process at community level.

Malawi’s new National Irrigation Policy and Development Strategy (GOM, 2000) is seen as means of increasing incomes, production and food security by transferring smallholder irrigation schemes to farmers’ organisations. Irrigation management transfer (IMT) is a means to decentralise the state, to save public expenditure and to promote local ownership. The land reform in Malawi is taking place in the context a Poverty Reduction Strategy Paper (GOM: 2002) which is seen as the conceptual centre of the government’s reforms and involve: pro-poor economic growth, human capital development, improving the quality of life for the most vulnerable, and good governance. Yet these poverty reduction strategies with regard to irrigation rest on the user pay principle so that the costs of infrastructure maintenance and development are to be carried by the users.

As Ferguson and Mulwafu (2005: 24-1) note for Malawi, “Customary land is to be titled, use of water for productive purposes will require permits, and government-run smallholder irrigation schemes are being turned over to users. These reforms arm to dramatically alter access to critical land and water resources for rural livelihoods in one of the poorest countries in the world.” The case study answers the following questions (Ferguson and Mulwafu, 2005: 24-1):

- How are the reforms underway in the land and water sectors likely to affect irrigation reform and smallholder irrigation scheme farmers?
How do the new reforms interact with existing customary land- and water-related, privileges and practices?

Who is likely to benefit from the transfer of the irrigation schemes to farmers’ organisations? (In other words there will be no private property ownership on the schemes but government will relinquish ownership).

Will these reforms provide smallholder farmers – especially the disadvantaged – with equitable and secure rights to land and water resources as the policies espouse, or will they create uncertainty and entrench privileged interests?

9.1.1. Domasi and Likangala Irrigation Schemes: Six Key Findings

The government run Domasi and Likangala irrigation schemes in the Lake Chilwa Basin in the Southern Region were established in the late 1960s and early 1970s. The Likangala scheme is 450 ha in size with approximately 1,300 farmers. The Chilwa Basin has six of the countries sixteen smallholder irrigation schemes which are to be transferred. These two schemes were fairly well run until the 1980s – in the 1990s with the transition to multi-party democracy the old rules and regulations for running the schemes have been ignored and the infrastructure is now in need of general renovation.

The research identified six interconnected key findings Ferguson and Mulwafu (2005: 24-4) argue that these key findings are applicable to the other irrigation schemes in Malawi:

9.1.2. Livelihood strategies

The study uncovered the fact that the schemes are pivotal to the local economy and the livelihoods of farmers:

- The majority of farmers interviewed were born on the schemes
- Farmers had diverse livelihood strategies notwithstanding this the irrigation schemes provided the major source of household food and income. Domasi smallholders were better off than Likangala smallholders
9.1.3. Tenure status

Land reform will be implemented by the government giving a lease to the farmers’ associations. Most farmers, irrigation scheme officials and government officials did not know that Water Users’ Associations (WUAs) would be legally empowered to run the schemes through a lease from government. In this situation of transformation lack of clarity a number of community options to reform are emerging:

✓ In Likangala the Traditional Authority is attempting to reclaim ancestral land
✓ In Domasi the majority thought that the WUAs were the old associations with old rules and regulations

9.1.4. Rights of access to plot

Concern has arisen on the Likangala and Domasi scheme as to who will have rights to access plots.

✓ The Likangala constitution limits access to plots to those from the Traditional Authority of Mwambo
✓ The Domasi constitution limits access to plot to Malawian citizens
✓ Women’s access to plots have not be been tackled. Yet 95% of Domasi respondents and 88% of Linangala said that women should be permitted to register plots in their own name
✓ In the past plots would be inherited by the children today the farmers are uncertain if this is still possible. Though in the past the committee was also known to redistribute the deceased’s plot to committee members or other influential person.

9.1.5. Landholding size

Originally the irrigation scheme had plots of 0.25 acre apportioned to farmers in groups of two or four plots. There is a trend that over the years, especially during the transformation of the 1990s, that plots are concentrated in the hands of the wealthy
farmers. Ferguson and Mulwafu (2005: 24-24-8) conclude that “some farmers have used a variety of mechanisms to gain access to more than four plots, including serving on scheme management bodies or having close connections to those who do, plot ownership by spouses and children, renting and borrowing, and, in some cases, use of falsified names.”

9.1.6. Rehabilitation and capacity building (revitalization)

Rehabilitation of infrastructure (roads, canals and headworks) has advanced slowly because of according to Ferguson and Mulwafu (2005: 24-24-8) “delays in funds and supplies, inputs going missing, problems with local contractors, heavy rains that destroyed renovated structures, farmers’ reluctance to provide labour, and other complications.” Farmers are reluctant to take over the schemes before the rehabilitation is completed. Many wondered allowed how they were going to succeed with running the scheme when the government had failed.

Research findings demonstrate that there has been very little capacity building. Only 13% of the sample had had any training. Of the fifteen farmers in the sample from Dumasi who had received training twelve were from the committee.

9.1.7. Authority structures

Authority structures are unclear even though there are “harmonized policies” in place. Farmers are unsure of the line of authority between UWC, TA and the Catchment Management Authority (CMA).

9.1.8. Conclusions

Many questions during the process of transferring control of irrigation schemes from government to farmers’ association remain. Such questions as equity, poverty alleviation,
and strategies for pro-poor economic growth need to be dealt with. For Ferguson and Mulwafu (2005: 24-10) unresolved issues include:

- Should plots on the schemes be redistributed to assure wider access to them as an equity and poverty-alleviation measure?
- Should a household’s other landholdings, particularly valuable wetland and streambank gardens, be taken into account if reallocation of plots on irrigation schemes were to take place?
- Should redistribution of scheme plots continue during the dry season as one means to broaden access? Or
- Is pro-poor economic growth best served by permitting greater plot concentration?

“Finally, consideration should be given to broadening the scope of the new water users’ associations. Experiences from elsewhere in the world with irrigation transfer suggest it is most successful on schemes that have relatively small numbers of plot holders with larger plot sizes who depend on the schemes for most of their livelihood and where the costs of scheme management are a small proportion of income. Fewer numbers of better-off farmers are easier to organize and monitor, and they are more likely to be willing and able to shoulder the costs of running the schemes” (Ferguson and Mulwafu, 2005: 24-12).

Shah et al. (2002) have argued that if irrigation management transfer in Africa is to be more than a means of “getting irrigation off the back of governments,” it must be part of a broader strategy to remove capital, input, and marketing constraints and to enhance economic returns to the smallholder farming.

9.2. Revitalization in Irrigated Agriculture Projects – Kenya and Ethiopia

9.2.1. French Funded Initiative for Improving Irrigation Performance in Africa

The project exists in West Africa and in East Africa (Kenya and Ethiopia) on a total of 15 sites. The East African section of the project is reviewed by Denison and
Manona (2007: 3-18-23). An important aspect of the programme is to train partners in Participatory Rapid Diagnosis and Action (PRDA) to ensure that implementable solutions are found. These results are: shared between schemes, used to identify other research topics, used develop training material, and used to innovate new practices and technologies. PRDA is “an approach for analyzing and improving the performance of an irrigation scheme together with farmers” (van der Schans, 2005). And this is achieve by:

- Diagnostic processes to assessing their performances
- Developing solutions to improve the scheme including technical, farm production training, marketing and institutional interventions
- Implementing agreed solutions, and
- Monitoring in following years to see whether the performance is actually improved by the implemented solutions.

The PRDA team includes: irrigation engineer, agronomist, economist, specialist of farmers’ organisation. The diagnostic analysis framework based on these areas of expertise informs the process of constraint evaluation and the development of solutions. The elements in the framework are:

- The irrigation scheme infrastructure and the technical constraints determined by the design and scheme layout
- The farm production system and its elements of crop selection, agricultural techniques, allocation of labour and financial resources
- Organisational elements linked to water allocation, operations and maintenance. This is ranked as a high priority for sustainability of schemes
- The socio-economic environment which are the links of the on-scheme organisational and production elements with external players, such as markets, extension, input providers etc.

Typically the team requires the following time to provide its inputs: 10 ha analysed over 11 days; 100 ha analysed over 15 days; 1000 ha analysed over 25 days.
9.2.2. Key Successes in Irrigation Interventions

The key successes in irrigation interventions gathered from the review of the revitalization programme in Kenya and Ethiopia and a review of the revitalization programme in Tanzania as well as irrigation management transfer experiences in Africa and Asia are summarised as follows (Denison & Manona, 2007: 5-29 – 30):

- Demand driven interventions (farmers requesting support) in irrigation schemes have performed better than supply-driven interventions (government or donor promoting a programme) with moderate or low levels of farmer support.
- Interventions with equal attention to both physical and social and institutional systems (revitalization programmes) have higher rates of success and are excellent models.
- Comprehensive strategies focusing on all the multiple irrigation activities (water, markets, finance, inputs, production information) required for a successful scheme are most likely to succeed. “The experience from the review is explicitly clear that infrastructure development alone or as a dominant part of the intervention are destined to failure. Farmers in smallholder schemes need support systems that go far beyond just the irrigation system if they are to improve their livelihoods significantly. Irrigation is a highly complex mix of social, agriculture, market and technical parameters, which are in a state of on-going flux and interconnectedness. Irrigation planners and advisors must, as a critical priority, embrace the multiple sectoral interests and dynamics in planning thinking. Narrow isolated, engineering and infrastructure driven programs are destined to fail in their objectives” (emphasis in original).
- IMT (and in this case the intervention process in general) must hold out the promise of significant net improvement in life situations for a significant proportion of members and the irrigation system must be the central resource to creating an improvement in farmers’ life situation (Shah et al, 2002).
The economic and financial cost of sustainable self-management must be an acceptably small proportion of improved income and the proposed organisation design must have low transaction costs (Shah et al, 2002).

Lift strategy – In addition to getting the process right, and addressing the complex of activities, there is a need to devise a lift strategy which deals with the whole host of constraints to profitable production. This implies favourable natural resources, knowledge, motivation, management and the critically needed independent agricultural support services (Crosby: 2000 in Merrey et al, 2002).

The intervention process and design needs to engage aggressively with the individuality of on-scheme complexity so as to identify elusive and marginal advantage by deliberately accentuating inter-disciplinary synergy within the intervention team and between the team and the participant farmers. The approaches cannot rely on vague or routine use of PRA methodologies but have to ensure meaningful transfer of information rooted in time-consuming and expensive processes, leading to fully informed decision-making on the part of participant farmers. Ownership is rooted in the information transfer and decision-making process.

Participation, ownership and appreciation of diversity at scheme level need to be integrated with livelihoods strategies outside of the irrigated context. This means taking account of multiple water needs for personal uses, livestock, fishing, laundry, small business (brick-making) and the like in addition to irrigation.

Planners must adopt realistic yield projections, pricing structures based on smallholder realities of production and marketing, so that the resultant financial evaluations on which the investment decisions are based are realistic. To this end, teams with the thinking driven by engineers and economists need to raise significant internal caution on the information that informs concept planning and evaluation. The socio-economic and agricultural production realities of isolated sites, difficult communication, and relatively poor supporting infrastructure must ground financial planning, rather than idealistic or average commercial sector scenarios.
Access to reliable water is an essential, though not sufficient condition for sustainable improvement in irrigated agriculture. The productive use of water depends on irrigation technology but will only be successful when market development and information supply to farmers are made a core priority in the overall intervention design.
10. RESIS

The Limpopo Revitalisation of Small Irrigation Schemes (RESIS) evolved from the Limpopo Water Care programme and it is fundamentally the fourth phase of the programme. With the integration of the RESIS programme in 2005, into the Limpopo Provincial under the new department head and MEC the RESIS Recharge programme was introduced to meet more rapid delivery (Denison and Manona: 2007).

The evolution of the RESIS programme can be outlined in its various phases as follows:

- Northern Province Irrigation Scheme Project (Water Care Pilot Programme) involved three pilot projects: Timeframe 1998 – 2001;
- WaterCare Programme – 5 Mega Plan I involved five pilot projects: Timeframe 2000 – 2002;
- Revitalisation Programme of Small Irrigation Schemes (RESIS) involving 126 schemes: Timeframe 2003 – 2010;

Throughout this evolutionary process the importance of participation was emphasized and there was a shift from rehabilitation of old irrigation infrastructure to revitalization. Rehabilitate focuses on the engineer aspects of reconstruction of faulty infrastructure. Revitalization is a holistic approach which improves the infrastructure and builds the capacity of the community to manage and participate in the scheme through a variety of training; and revitalization aims at value-add agri-businesses on the scheme. This evolution was curtailed with the introduction of RESIS Recharged which shifted the focus back to infrastructure without the elements of human capital development. This section will analyse the phases of the evolution of this programme and will conclude with an assessment of the programme’s success and challenges.
10.1. Limpopo WaterCare Programmes

After 1994 the national government stopped subsidizing smallholder irrigation schemes throughout South Africa almost all of them collapsed. Limpopo province organised an innovative approach to this challenge.

10.1.1. Northern Province Irrigation Scheme Project (Water Care Pilot Programme)

There were seven central elements and principles of this approach to smallholder irrigation schemes which have remained at the core of the programme as it evolved to the RESIS stage. These elements and principles often accentuate how to encourage participation in the schemes as it was a point of departure that without community support, participation and through training management in the scheme the scheme would not succeed:

- **The pre-development study**
  The study involved both a social-institutional survey and technical surveys. The social-institutional survey was undertaken before planning in order to highlight the social context of the irrigation rehabilitation. This survey provides an understanding of the community and the irrigation scheme through exploring the community’s problems, needs, fears and aspirations with regard to irrigation.

  Technical surveys were also conducted on the infrastructure, natural resources and agricultural potential.

- **Capacity building and participation**
  Development committees were established at scheme level to encourage active participation in decision-making. The committees’ prime responsibility was to co-
ordinate the process for the farmers. The committee became the Water User’s Organisation’s Management Committee. During this phase there was no money for management training.

- The Turnkey approach
  The turnkey approach was the term used for making the community central to all decision-making and for carrying out minor repairs. Local labour and contractors are employed to do the maintenance.

- Agricultural training
  Intensive agricultural training took place from June 1999 to March 2000. Training included choice of crops, planting techniques, fertilizer and pesticide application, spraying, harvesting, storage, transport and marketing.

- Stimulating land leasing within the customary land tenure system
  The Limpopo smallholder irrigation schemes tend to have the traditional land tenure system – which means that the traditional authority has official ownership of the land. Permission to occupy is inherited and is not something that can be sold. If land is unused it can be returned to the chief. This land tenure system was seen as an obstacle. At the outset of the project only 40% of the land was in use. The consultants encouraged land-leasing for the committee farmers to attain more land. Once this was up and running it led to conflict with the chiefs and it was claimed it was illegal.

- Rehabilitation of the infrastructure
  There was a limited budget, which was fully utilized, for the upgrading and repairing of the existing infrastructure. There were no funds to realign or redesign aspects of the scheme which were seen to be problematical.

- Building a local management structure
The management structure was set up to ensure that representatives of the scheme would eventual management of the project. There was no budget for training.

10.1.1.1. Positive Impacts

The following positive impacts from this intervention were reported:

- The pre-development identified the concerns of the community and their priorities;
- The irrigation scheme still has a functioning management committee, yet in some areas it functions poorly;
- Water availability has improved in the scheme (though some people say it has not improved);
- The farmers claim that their increased yields are a result of the agricultural training;
- The cost of the scheme to government has been reduced by rationalising government staff on the scheme from 100 people to 90.

10.1.1.2. Challenges

The following issues of concern were identified:

- Feeling of ownership over the project: there seems to have been a problem of communication as not all in the community are in agreement;
- The Management Committee and the community are not in touch: Information is poorly shared. The larger commercial farmers are on the committee – the smaller subsistence farmers are not represented on the committee;
- Problems around land tenure: people hold onto there land with no intention of farming;
- No credit or financial support is available: the programme implicitly assumes commercialization yet there is no credit support until the smallholders get on their feet.
10.1.2. WaterCare Programme – Mega Plan III

By the 3rd phase of the Limpopo initiative the programme emphasized revitalization activities when compared to the initial pilot phase discussed above. (There is no discussion on the 2nd phase as the evaluators felt that there was not enough differences between the pilot and 2nd phase.)

Greater emphasis was placed on:
- Farmer training
- Establishment of a Water User’s Association (legal and constitutional)
- Collective organisation around water-use practicalities (practical and organisational)
- Subsequent transfer of management responsibilities and ownership of the facilities to the WUA

The main difference between this phase and earlier phases was the scale of the budget for social and technical transformation. The same approach was used and often the social contact methods were improved and expanded on and there were also some new components:

- Empowerment training - capacity building and empowerment training were used to stimulate the processes of transformation to ensure that participation takes place. Personal growth and skills training were linked;

- Joint ventures - partnerships between smallholders and mainstream agribusiness were established to address the issues of credit facilities for example seed financing and other input costs, agricultural implements and markets. Cotton was chosen as the crop because of the ready market.
The joint ventures were a key shift from infrastructure (engineering centred) to finance and markets (agribusiness and skills development centred) and in funding from hard (infrastructure) costs to soft costs (training).

- Techniques such as community mapping and relationship strengthening, and mapping the present and the future were use to sharpen the focus on problem identification and prioritization. And from this process to interpret the community’s prioritise in terms of the possibilities of the irrigation scheme.

- Mass meeting – mobilization of the community was seen as important in keeping the community abreast of the process.

- Local management body was established which could only have farmers on the committee – there was an attempt to limit the role of councillors and teachers on the committees.

- Technical committee – to record maintenance requirements such as faulty canals, broken structures and uneven fields as well as to uncover the reasons for this state of affairs.

- Hands-training on project and scheme management – the objectives of the training programme are:
  - Project management – managing the rehabilitation process
  - Scheme management (day-to-day management of the scheme)
  - Building confidence in local leadership abilities
  - Mind-mobilization/taking ownership

- A period of mentorship – to support the management training was successfully introduced.

10.1.2.1. Positive Impacts
- Project management and ownership – compared to people’s perceptions and experiences in the pilot phase this phase was far more successful in ensuring that the community had a strong sense of ownership of the project and the scheme itself.

- Leadership and representation – the leadership were involved in managing projects and the irrigation scheme thorough which they gained experience. They leadership is learning to work with the community and to keep the community informed.

- Cohesion in the broader community – the communities thanks to the process of meetings remain on board the project. The people had taken responsibility for the (their) path chosen.

10.1.2.2. Challenges

These challenges are raised in order to inform and where possible improve the developmental process.

- A more holistic approach towards development of technology – the evolution of the water care programme from physical rehabilitation to agricultural, personal development (empowerment) and management training has not been matched by an understanding of this complex integrated method. The interconnections between management and irrigation layout need to be developed. For example, most irrigation schemes give less water to the “tail” than the “head” – management needs to deal with this.

- Discussion on after care, mentorship and extension officers – the key issue here is how to facilitate self-management so that the programme can be concluded and confidently handed over to the community. This process in fact requires a shift in
thinking for all concerned. For example, the department of agriculture’s agricultural extension service which will continue supporting the project once the consultants are withdrawn needs to be trained in order to handle this new task. The extension officers planned an important role in the project – this role needs to be reappraised to permit new tasks of support especially in the roll out phase.

- Additional scheme, water and farmer organisational models need to be considered – alternative management models need to be explored.

- The need for explicit choices on commercialisation Vs subsistence – the revitalization programme has aimed at self-management and financial self-sufficiency and this therefore implies that the scheme is aimed at commercialisation. This objective has never been explicitly developed that the scheme would move towards a cash based external market.

By not making this commercialisation objective clear many subsistence and non-farmers remain in the scheme placing a burden on it. Commercialism is justified in terms of improving the quality of people’s lives and making the scheme financially viable. The challenge is to find a means of permitting those who are unable to farm commercially to continue farming.

- Irrigation revitalisation initiatives to extend beyond the scheme boundary – irrigation schemes are more than the physical infrastructure and irrigated land they involve the larger extended communities. These communities need to be incorporated into upliftment programmes. Two central issues are food security in the larger community and promotion of a land-leasing market.

### 10.1.2.3. Concluding assessment

The Limpopo Provincial Department of Agriculture was prepared to embark on learning process through each phase of the project – this was one of the objectives of
the pilot phase - permitting new ideas to be incorporated into the programme – especially as regards the issues around human capital. The key changes in the evolution of the approach from physical rehabilitation to revitalization, the change from infrastructure focus to people using infrastructure (implying a comprehensive programme to structure, train and capacitate the smallholder farmers to run their scheme sustainably) may be summed up as follows:

- Project timelines were extended to permit more time for the process of participation to be facilitated and nurtured.
- In this phase of the project more decision-making was left in the hands of the community compared to the early phases. Thus more time was spent building capacity.
- The budget was diverted from physical infrastructure rehabilitation to the process of revitalization: farm training, capacity building of management, capacity building of farmers and capacity building of community.
- Efforts have been made to set up markets and to establish agri-business.

10.1.3. RESIS: Fourth Phase of WaterCare Programme

RESIS is in fact the 4th phase of the WaterCare programme and incorporated the experiences of those programmes and hence RESIS continues in the same direction with greater emphasis on new international best practices and greater emphases on revitalization. Revitalization follows international practices of including a comprehensive package of people development to ensure that they have the capacity to drive, manage and maintain the scheme into the future. There was a major increase in the programme size from 34 schemes to 126 schemes. This is almost half the smallholder schemes in South Africa. Each scheme requires a full four-year cycle on interventions. The costs over 6 years are 1.08 billion.

The RESIS programme was effectively terminated in May 2005 by internal changes in the Department of Agriculture before the strategy had achieved any scale or impact other than the initial planning on half of the irrigation schemes. So the discussion will
outline the programme and where possible appraise the programme in the context of available information.

The objectives of RESIS were as follows:

- The participation of the communities with all the programme activities and methodologies aimed at successful implementation. This was to be achieved by:
  - Raising and sustaining incomes of farm families
  - Transforming society by enabling rural households to exercise more control
  - Maximizing benefits to the broader community
- The participation of government systems including personnel and the support systems required to support programme implementations and aftercare. This was to be achieved by:
  - The transformation of government services (which is reflected in the Integrated Provincial Support Programme)

A key feature of the RESIS programme is a Multi-Disciplinary Team composed of government and private sector staff to ensure a range of skills for every facet of the programme.

10.1.3.1. RESIS Innovations

The core elements of the RESIS programme are based on those points outline above in the First and Third phases of the WaterCare programme. In addition there are a number of innovations – these are:

- A substantially broadened scope of development activities – the expansion of the schemes boundaries to include the adjacent villages. Activities such as are now included livestock development, dryland food production, intensive home-gardens.
- Linkages with local economic development initiatives such as district or local municipality IDP project.
The sequence and timing of scheme intervention activities – training coincides with the summer and winter crop planting so the results are tangible. Marketing exercises take place once the crop is in the ground.

The RESIS programme actively engaged with catchment planning - rationalising each scheme priorities in terms water supply for different projects.

Flexible response to a wider range of community priorities, resource diversity and developmental opportunities – the interventions planned took in a range of options such as homestead food production, multiple uses of water, livestock and scheme interrelationship and dryland crops.

10.1.3.2. RESIS Challenges

The following issues need to be considered if the RESIS is to be viable as each places limitations on RESIS and taken together they may well derail the programme:

- Profitability and sustainability – financial profitability is considered the critical factor. Success in the past on South Africa’s scheme has been related to market opportunities and the profitability of the farming. This puts pressure on those who are only interested in subsistence farming. The scheme needs to identify whether it is commercial or subsistence (or both).

- Diversity on schemes and between schemes – RESIS correctly aims at scheme specific solutions as these have proved international to be the best practice. Each scheme will have some unique challenges and solutions. The diverse scale of the RESIS programme (126 schemes) militates against addressing the specifics in detail. For example time constraints of key staff.

- Farming styles which contrast with a linear farmer development trajectory – RESIS has a three step progression from subsistence farmer to semi-subsistence to commercial farmer as an important objective of the intervention. In reality such a steady progression to higher and higher levels of farming may not be achievable
because farm styles may well be linked to other factors which have impacted on the choice of a farming style in the first place. Such factors which impact on farmers are the following:

✓ Different farming strategies linked to their differing objectives of food production or profit generation
✓ Different exposure to risk influenced by crop selection, land area planted, service providers used and social network maintained
✓ Different strategies for marketing produce, nature of labour hired and farming requisites purchased and utilized

❖ Farm size and land leasing market – it is generally agreed that small plot size (0.5 ha to 1.5 ha) make farming challenging. Income is essential to cover water charges, maintenance and input costs. If commercialisation is an objective then there ought to be the promotion of a land-leasing market to enable willing farmers to increase their landholding size.

❖ Challenges which the Department of Agriculture must face are:

✓ Lack of expert skills available to drive the project. The Department of Agriculture strategy was to use local and provincial staff to assist with agricultural planning, agro-economic evaluation, training, institution building and marketing. Yet the department does not have the staff with these skills in the numbers required for such a large programme.

✓ The government procurement process is uncertain and lengthy. The procurement system one year into the programme has not risen to the challenge of processing over 200 construction and consultancy assignments.

✓ The broad spectrum of interventions presents a challenge for co-ordination within the Department of Agriculture. (The interventions cover every facet of rural development from irrigation to road maintenance to cattle management to market and more. This challenge has not been met.

✓ Extension officers are being brought into the RESIS programme without any experience or training.
There is a capacity building opportunity for the department but it is unclear whether the department’s performance assessment system and human resource planning can plan such a large operation.

10.1.4. RESIS Recharge

The RESIS Recharge programme was launched to “address the missing gear” (Polokwane Observer, 2005). The RESIS Recharge programme implies “industrial agriculture” – this is assumed to refer to the new emphasis on bulk water and infield infrastructure through large scale investment in sprinkler system. The industrial would seem to refer to the scale of investments in technology and the hoped for mass production made possible by such infrastructure.

The RESIS Recharge phase by its prime focus on investments in large scale infrastructure and a concomitant disregard for the human capital elements of the revitalization strategy means in fact that the programme has become one of rehabilitation and expansion of infrastructure. Though theoretical there is still mean of human capital (on-scheme planning, scheme institution building, farmer crop production training, market and financial skills training) in practice this crucial aspect of RESIS is ignored.

Commercial partnerships are seen as a key Recharge strategy to reach to RESIS aims of:

- Successful profitable agricultural production
- Job creation
- Poverty alleviation
- Gender empowerment; and
- Community upliftment

The last research data on the RESIS Recharge programme is from 2005. If the RESIS Recharge programme has continued down the infrastructure path without the human
capital components then it will lead to its own demise. More studies need to be done in this area.
11. Future Scenarios for RESIS

From the review of the literature one can state categorically that the current RESIS strategy in its RESIS Recharge phase is on the path of failure. The RESIS Recharge phase by its prime focus on investments in large scale infrastructure and a concomitant disregard for the human capital elements of the revitalization strategy means in fact that the programme has become one of rehabilitation and expansion of infrastructure. Though theoretical there is still mention of human capital (on-scheme planning, scheme institution building, farmer crop production training, market and financial skills training) in practice this crucial aspect of RESIS is ignored.

Although the last research done on RESIS was in 2005 and a more detailed analysis is required in order to analysis specific issues of the programme the literature on research monitoring and evaluation of irrigation programmes is very clear and in agreement on the point that schemes which focus primarily on irrigation will fail:

✓ “The experience from the review is explicitly clear that infrastructure development alone or as a dominant part of the intervention is destined to failure (emphasis in original) (Dension and Manona, 2007: 5-29).

✓ “Smallholder irrigation is a highly case-specific, potentially complex, dynamic socio-biophysical entity influenced by a considerable number of internal characteristics and external driving forces and factors, and is a driver of considerable change on downstream sectors and users. Have we recognised this special nature of irrigation within livelihoods, food and cash production, river basins and the environment?” (Lankford, 2001).

✓ “Focusing more emphasis on the improvement of physical infrastructure is not sufficient. There is a need for a more comprehensive approach, encompassing the development of both physical capital as well as social capital that provide complex systems… to use irrigation water” (Neeraj et al, 1998).
“Access to reliable water is an essential, though not sufficient condition for sustainable improvement in irrigated agriculture… the productive use (of water) depends on irrigation technology but will only be successful when market development and information supply to farmers are made a core priority in the overall intervention design” (emphasis in original) (Dension and Manona, 2007: 5-30 developing ideas of Merrey et al, 2003).

The reasons for this can be summarised from the discussions above where it was argued that the following issues need to be considered if the RESIS programme is to be viable as each of these issues place limitations on the success of the programme and taken together they may well derail the programme:

- The RESIS Recharge programme has answered the choice between profitability and sustainability by committing itself to commercial activity – it remains unclear what will happen to the subsistence farmers.

- Diversity on schemes and between schemes – RESIS correctly aimed at scheme specific solutions RESIS Recharge with its focus on irrigation infrastructure appears to taking the path of one size fits all. In either case each scheme will have some unique challenges and solutions. The breadth of a programme involving 126 schemes militates against addressing the specifics in detail.

- RESIS has a three step progression from subsistence farmer to semi-subsistence to commercial farmer as an important objective of the intervention. In reality such a steady progression to higher and higher levels of farming may not be achievable because farm styles may well be linked to other factors which have impacted on the choice of a farming style in the first place such as differing objectives of food production or profit generation; different crop selection, land area planted leading to different risks; different strategies for marketing produce and farming requisites; and farm size and land leasing market.
Challenges which the Department of Agriculture must overcome if there is to a successful project:

- Lack of expert skills available to drive the project
- It is unclear whether the department has the staff numbers to participate in such an extensive programme on 126 sites
- It is unclear whether the department has the management skills to co-ordinate such an extensive programme
- The government procurement process is uncertain and lengthy
- The broad spectrum of interventions presents a challenge for co-ordination within the Department of Agriculture.
- Extension officers are being brought into the RESIS programme without any experience or training.

Overall based on the discussion of the review of the literature the following points can be drawn regarding the viability of irrigation interventions with particular regard to RESIS:

- Demand driven interventions (farmers requesting support) in irrigation schemes have performed better than supply-driven interventions (government or donor promoting a programme) with moderate or low levels of farmer support.

- Interventions with equal attention to both physical and social and institutional systems (revitalization programmes) have higher rates of success and are excellent models.

- Comprehensive strategies focusing on all the multiple irrigation activities (water, markets, finance, inputs, production information) required for a successful scheme are most likely to succeed. Narrow isolated, engineering and infrastructure driven programs are destined to fail in their objectives.
Lift strategy – In addition to getting the process right and addressing the complex of activities, there is a need to devise a lift strategy which deals with the whole host of constraints to profitable production.

The intervention process and design needs to engage aggressively with the individuality of on-scheme complexity so as to identify elusive and marginal advantage by deliberately accentuating inter-disciplinary synergy within the intervention team and between the team and the participant farmers. Ownership is rooted in the information transfer and decision-making process.

Participation, ownership and appreciation of diversity at scheme level need to be integrated with livelihoods strategies outside of the irrigated context.

Planners must adopt realistic yield projections, pricing structures based on smallholder realities of production and marketing, so that the resultant financial evaluations on which the investment decisions are based are realistic. The commercialization drive needs to be carefully monitored with this regard.

Access to reliable water is an essential, though not sufficient condition for sustainable improvement in irrigated agriculture. The productive use of water depends on irrigation technology but will only be successful when market development and information supply to farmers are made a core priority in the overall intervention design.

11.1. A Simple Scenario for RESIS recharge

Given the overwhelming evidence for pro-growth and revitalized irrigation schemes the simple solution for the best outcome of the RESIS recharge programme is to implement the RESIS strategy of revitalization.
A brief outline of the elements and principles which need to be reintroduced into the RESIS recharge programme are:

- The pre-development study
- Capacity building and participation
- The Turnkey approach
- Agricultural training
- Stimulating land leasing within the customary land tenure system
- Rehabilitation of the infrastructure
- Building a local management structure
- Sharpen the focus on problem identification and prioritization.
- Mass meetings – mobilization of the community was seen as important in keeping the community abreast of the process.
- Establishment of local management body with only farmers on the committee
- Technical committee – to record maintenance requirements such as faulty canals, broken structures and uneven fields as well as to uncover the reasons for this state of affairs.
- Hands-training on project and scheme management – the objectives of the training programme are:
  - Project management – managing the rehabilitation process
  - Scheme management (day-to-day management of the scheme)
  - Building confidence in local leadership abilities
  - Mind-mobilization/taking ownership

- A period of mentorship – to support the management training was successfully introduced.

11.2. Towards Revitalizing the Revitalization Components of the RESIS Programme

The main programme of action must be revitalizing the revitalization components of the RESIS programme.
Firstly, the RESIS recharge programme sites need to have a rapid appraisal conducted to determine the new status quo.

Secondly, if as predicted by the literature there are problems then the RESIS recharge programme needs to implement a French type solution as used in West Africa and East, viz., bring in teams of experts to move through the sites to boost the overall understanding of the programme. Keep the programme within the pro-poor growth parameters.

Thirdly, refocus on the human capital and assembly capacity building teams to facilitate the process. (This would boost the specialists in farmers’ organisation component of the French solution thereby boosting the human capital within a re-established vitalization programme.)

Fourthly, introduce capacity building into the Department of Agriculture with French style capacity building teams.

Fifthly, increase monitoring and evaluation of the RESIS recharge programme.

11.3. Revitalization within a Pro-Poor Growth Strategy

A revitalization of the RESIS irrigation needs to take place within the context of the following broad pro-poor growth initiatives:

- Improve institutional environment and governance in the agricultural water sector.
- Involve communities in the management of agricultural water resources.
- Encourage public-private partnership in managing agricultural/irrigation water resources.
- Establish effective regulatory measures and mechanisms for transparency and accountability among service providers and water users.
- Establish clear water rights and water entitlements in the systems by introducing effective and enforceable legal frameworks with flexible provision for seasonal water use.
• Promote full O&M cost recovery to improve and maintain system performance (from which the poor benefit directly or indirectly) and to redistribute benefits of irrigation through larger contribution from the non poor for improving productivity of landless and marginal farmers.

• Introduce systems of advance payments of water fees by users to improve on collection rate.

• Promote shared management of surface and groundwater to help reallocate water to areas where groundwater is of poor quality.

• Develop, improve, and/or line canal infrastructure in areas where groundwater is not suitable for crop production.

• Introduce season-wise planning for equitable distribution and efficient use of available water resources.

• Improve markets for inputs and outputs.

• Improve economic value of water through diversification of both crop and non crop farm outputs.

• Promote cropping pattern changes from high water-consuming crops to low water-consuming, but high-value crops (e.g., paddy to high-value crops).

• Clearly recognize and incorporate rural poverty concerns and the need and importance of pro-poor interventions in national and subnational-level policies and plans.

A revitalization of the RESIS irrigation needs to take place within the context of the following targeted pro-poor growth initiatives:

• Promote pro-poor institutional arrangements, including
  ❖ Involving the poor/smallholders in water management decisions, i.e., establishing and strengthening water users associations (WUAs) with due representation of the smallholders and the poor; and
  ❖ Establishing and strengthening separate WUAs of tailenders in situations where there are significant head-tail inequities in water distribution.

• Establish guaranteed minimum water rights for smallholders in drought and scarcity conditions to ensure household food security.

• Especially where there is significant inequity in land distribution, establish pro-poor water allocation/distribution rules that will allocate more canal water per unit of area for smallholders as compared with large farmers. Give priority in water allocations to areas and command reaches where poverty incidence is higher.

• Promote canal water reallocations to canal command areas or reaches where groundwater is of poorer quality, mostly tail ends where incidence of poverty is relatively higher.

• Develop pro-poor (discriminatory) pricing systems such as differential pricing for larger areas beyond specified ceiling per farm household.

• Create employment opportunities for the poor, including the landless, by involving them in O&M, water fee collection, and other supervisory activities.
• Increase productivity and value of water in ways that favor the poor, such as promoting crop diversification toward high-value crops on smallholder farms through the provision of necessary incentives, information, and support.
• Target technological support, such as providing high-quality seeds, fertilizers, credit, and agricultural equipment to land leveling for the poor communities in canal commands.
• Provide monetary and technical support to install pumps or other water-lifting devices for communities in command areas or canal reaches that are relatively poorer but have good quality groundwater.
• Prioritize command areas or reaches with relatively greater poverty incidence for infrastructure rehabilitation and upgrading, and for new infrastructure for storage and distribution of water.
• Improve markets for the inputs purchased and outputs produced by the poor.
• Build capacity of smallholders and the poor through information and training programs.
• Develop databases on poverty, location, incidence, and depth of poverty, and monitor poverty regularly.
• Encourage research on agricultural water and poverty.
12. Conclusions

12.1. Conclusion: Framing Development: Towards a Developmental State which Focuses on Pro-Poor Growth

This literature review, with its focus on the public sector and/or private sector investment in agricultural infrastructure and poverty reduction through creating sustainable farming income, is topical and relevant to the current the public conversation on creating a Developmental State. It would appear that the South African debate on development will involve a developmental state. Neither the literature review nor the research topic focuses on the extensive conversation on the nature of the state as an abstract entity. In other words the state as an organisation is noted; the starting point of the research investigation is development projects within the framework of local economic development. Hence, the position taken here – the aim and objective of the research investigation - is to find a path or the means of establishing socially viable and economically sustainable irrigation schemes. This literature review presents an overview of the literature on agricultural infrastructure in the context of local economic development and within this presentation the endeavour is to identify the issues which need to be considered in order to establish sustainable irrigation schemes.

This methodology of investigating agricultural irrigation projects is thus located within the context of the African and global knowledge and experiences and part of the successes it will be demonstrated is good governance. It is therefore a very clear assumption that there is a need for government intervention to kick start development. Yet, this research project is informed by a methodology which does not have an ideological conception of state or public intervention as its starting point; this methodological framework rests on the assumption that development is best achieved through a dynamic and interactive chain of research, action research, implementation of projects and monitoring and evaluation which can inform, expand and cultivate government procedures and policies. Thus, so to speak, the developmental state – within a nurturing policy environment – is socially constructed on a project by project
basis through the actions of individuals who create a new sustainable path into their future, the future of their communities and the future of the South African state.

It follows that the literature review is process orientated and it attempts to answer the question how can smallholder irrigation projects best be established and run with a particular focus on agricultural infrastructure in irrigation schemes. Clearly there are social, cultural, political, contextual and macroeconomic issues which impact on all LED projects – these were identified in the literature review in order to understand the socio-economic structures. The point, however, is to focus on the specific dynamics of each smallholder irrigation scheme, to determine the nature and causes of the dynamics (in the context of the socio-economic structures); in particular the focus is: what is the role of the irrigation scheme (both community and irrigation infrastructure) in initiating and sustaining the smallholder dynamic and in determining the potential for success?

This research project is conceptualized within and informed by a research methodology that, it is argued here, will lead to social and economic success in time because it seeks to outline the necessary steps to developing a successful project on a case by case basis and it does not attempt to construct an abstract national programme which is then rolled out regardless of local social, culture, psychological and economic conditions. While some successes may be achieved by a one size fits all national approach it is argued here that the case by case approach will provide a secure foundation for local economic development.

The research process emulates the REED process: “The potential strength of the Rural Economic and Enterprise Development framework lies in its focus on development constraints within the rural space, based on a systematic analysis of the situation and subsequent joint learning by all stakeholders, instead of reliance on theoretical development concepts (REED: 2003, 80).”
This review creates the framework for the research methodology so that the research will be better able to inform policy through the monitoring and assessment of the learning achieved at a project level. The South African Policy Coordination and Advisory Services (2007) states: “Monitoring and evaluation is the life-blood of sound and efficient planning and implementation. For it to add value to government work and to the broader process of social transformation, it should be based on objective measurements that reflect the ideals in our Constitution: to improve the quality of life of all South Africans and ensure that South Africa contributes to the creation of a better Africa and a better world” Through this means a step by step approach to the development of smallholder irrigation schemes can be outlined and used to reappraise government policy and procedures. The guidelines can inform both project development and government intervention strategies. This approach, based on the knowledge of particular successes and failures will be able to inform new or reformulate government programmes and policies so that there can be a duplication of the successful smallholder irrigation schemes. Finally, this approach is cost efficient, as it implies a monitored step by step approach to projects and, hence it will prevent an ill-informed public programme being embarked upon.

It is believed, and argued here, that creating sustainable projects such as smallholder irrigation schemes is the way to construct a viable developmental state. The process of local economic development as suggested above involves the chain of research, action research and implementing projects (and monitoring and evaluation) and onto reinventing government procedures and policies to ensure the steady flow of projects stimulated by government intervention (with private sector partnerships). It is through this cycle that a South African developmental state can emerge rooted in the day to day reality of the individual smallholder irrigation scheme.

This research methodology does not imply that once a clear programme of the necessary steps is provided from the literature review that development will automatically take place. The very focus on particular projects demonstrates that it is the dynamics of the particular scheme which will drive the development process. And
the dynamics of the particular scheme rests on the smallholder himself or herself who accepts responsibility for the success or failure of their own efforts and hence the success or failure of the project – within the context of a sympathetic reinvented developmental state. In the final analysis development will be succeed “if individuals seize responsibility for their own lives.” It is also a responsibility which must be accepted by individuals in the chain of delivery, i.e., government officials connected to the service delivery of the development programme.

The issue of responsibility raised here, in the context of South Africa in terms of a developmental state in order to overcome the legacy of the past, parallels and is similar to the responsibility which Barack Obama urges Afro-Americans and all Americans to face in his address to the NAACP on 15 July 2008. (The Philadelphia Inquirer 15 July 2008).

Barack Obama said: "I know some say I've been too tough on folks talking about responsibility. NAACP, I'm here to report, I'm not going to stop talking about it. Because as much I'm out there to fight to make sure that government's doing its job and the marketplace is doing its job, ... none of it will make a difference — at least not enough of a difference — if we also don't at the same time seize more responsibility in our own lives." (The Philadelphia Inquirer 15 July 2008).

Obama continued: "When we are taking care of our own stuff, then a lot of other folks are going to be interested in joining up and working with us and taking care of America's stuff. We can lead by example, as we did in the civil rights movement. Because the problems that plague our community are not unique to us. We just have them a little worse, but they're not unique to us."
12.2. Conclusion: Research Issues on Pro-Poor Growth on Revitalized Irrigation Schemes

The literature review contains a number of interesting themes for a research project to consider in the discussion of pro-poor growth and in connection with the revitalization of irrigation schemes. These themes are recorded here as a guideline to research themes and questions which need to be further explored in the field:

The research macroeconomic picture from growth indicators and poverty indicators – the poverty indicators may be more helpful as they link more directly to the research project:

- **Economic Growth Indicators for South Africa**
  - GDP growth
  - Real per capita GDP growth
  - Foreign direct investment
  - Gross fixed capital formation
  - Budget deficit before borrowing
  - Government debt
  - Interest rates: real and nominal
  - Inflation measures: CPI and CPIX
  - Bond points spread
  - R & D expenditure
  - Exports
  - BEE transactions
  - Black managers

- **Poverty and Inequality Indicators for South Africa**
  - Per capita income
  - Inequality measures (e.g. Gini Coefficient)
  - Poverty headcount index
  - Poverty gap analysis
  - Social-assistance support
  - Life expectancy
  - Living standards measure

REED’s identified ten cornerstones for successful intervention are each potential research themes to be explored in the understanding of the dynamics on an irrigation scheme – the research would establish if these factors are in place:

- An enabling environment that provides attractive investment climate and fosters dynamic entrepreneurship;
- Adequate mechanisms and structures that address local needs;
- Active private sector institutions and linkages;
- Functioning and effective infrastructure (hard and soft);
- Access to integrated and open markets;
- Access to effective and efficient support services and resources;
- Adaptive management capacity and entrepreneurial competence within business and enterprises;
- Local organisations, groups and associations (representing the poor) as building blocks;
- Active participation in and ownership of development processes by well-linked stakeholders; and
- Ongoing learning from successes and failure by all stakeholders.

REED identifies how infrastructure enables the rural entrepreneur. Each of these points is a potential research theme:

- Access to inputs
- Access to markets
- Minimise the costs of doing business
- Facilitates the production process

REED identifies the positive impact of infrastructure on the rural population. Each of these impacts is an issue to be considered whether it is suitable to be investigated by the research project:

- Improves quality of life
- Improves the socioeconomic opportunities of rural life
- Improves the environmental benefits
- Improves health benefits.

REED identifies the main actors engaged in supplying operating and efficient infrastructure. Each actor should be considered for inclusion in the research project:
- Governments (all levels) e.g., regulatory bodies, state and parastatal service providers;
- The private sector (enterprises, consumer organisations, large-scale investors);
- Rural communities and their organisations and associations.

For REED rural infrastructure is either lacking or rural people lack access to it or it is poorly managed and maintained. REED identifies a wide range of rural infrastructure each of which would encourage pro-poor growth and improves the opportunities for employment. Each of these different types of infrastructure may be considered for inclusion in the research project:

<table>
<thead>
<tr>
<th>Hard Infrastructure</th>
<th>Soft Infrastructure</th>
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<tbody>
<tr>
<td>Electricity supply</td>
<td>Financial and other business service-providing institutions, e.g., commercial banks, advisory services</td>
</tr>
<tr>
<td>Housing</td>
<td>Healthcare and other social/welfare systems</td>
</tr>
<tr>
<td>Marketplaces</td>
<td>Informal savings clubs</td>
</tr>
<tr>
<td>Offices and business premises</td>
<td>Markets</td>
</tr>
<tr>
<td>Roads and haulage providers</td>
<td>Post and courier services</td>
</tr>
<tr>
<td>Other transport systems, eg, railways, air services</td>
<td>Training</td>
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<tr>
<td>Sanitation and waste management</td>
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<tr>
<td>Schools</td>
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<td>Shops and other ‘town’ services</td>
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<td>Storage facilities</td>
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<td>Supply of gas</td>
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<tr>
<td>Telecommunications</td>
<td></td>
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<tr>
<td>Water supply</td>
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</tbody>
</table>

The Guide to REED outlines a step by step programme on how to set up functioning and effective infrastructure. This is useful and it also provides some themes for the research project into smallholders’ irrigation schemes. Such themes as identifying the infrastructure required, surveying business (and community) needs, increase in volumes using infrastructure, maintenance, maintenance costs, identify innovative management structures, need for cost recovery services and networking links (for supplies and markets). Cornerstone four (infrastructure) demonstrates the specific detail of the REED
programme and because of its flexibility in providing guidance to policy and strategies and as argued here to research projects.

**Table for Cornerstone 4: Functioning and effective infrastructure**  
*(hard and soft)*

<table>
<thead>
<tr>
<th>Content</th>
<th>Key strategy and process</th>
<th>Possible way to implement</th>
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</table>
| 1. Identifying the infrastructure required by rural enterprises | 1. Assess the existing infrastructure and identify gaps and the necessary improvements;  
2. Improve access to the infrastructure;  
3. Identify ways and means to reduce the costs of accessing the infrastructure. | 1. Survey of existing infrastructure and business needs;  
2. Identification of priorities and contributions in multi-stakeholder forums;  
3. Increase in the volume of goods or services using the infrastructure;  
4. Provision of low-cost solutions to enterprise needs. |
| 2. Providing the required infrastructure | 1. Encourage public and private investment in infrastructure;  
2. Privatise state utility service providers;  
3. Promote local, self-funded facilities, e.g. collective or co-operative services;  
4. Establish facilities on a correct and legal basis, e.g., access. | 1. Development of sound proposals for new or improved facilities with benefits to rural enterprise and the public.  
1. An independent regulatory body;  
2. Invitations to tender for management of services delivery contracts. |
| 3. Maintaining infrastructure | 1. Promote schemes to fund maintenance of local infrastructure (public and private);  
2. Promote innovative private management structures;  
3. Raise public awareness of the | 1. Schemes based on agreements with all parties, i.e., management contracts;  
2. Public services offered by reliable private entrepreneurs;  
3. Cost structures and |
Following it is fruitful to list the benefits of irrigation investments – this multiplier effect of irrigation investment impacts on larger sections of society beyond the farming community. Chambers (1988) and Barker et al. (2000) argue for taking the increase in income and employment – the indirect benefits of irrigation – into account along with increasing crop production and farm and family incomes in order to assess rural poverty reduction. Irrigation benefits are not limited to farming households but cascade into rural service sector and other off-farm employment (Mellor: 1966). What is important is the feedback process which generates additional income (wealth creation) and jobs.

Bhattarai et al. (2002) summarizes the total beneficial impacts of irrigation development, both direct and indirect. Each category identified highlights the different areas that a well-functioning project would display and there each category can be explored for its research potential in furthering the research project:

- Increased crop production (yield improvement) and increased farm income.
- Increased cropping intensity and crop diversification opportunities and the feasibility of year round crop production activities.
- Increased farm employment—more employment opportunities for farming families as well as for hired laborers in the locality.

<table>
<thead>
<tr>
<th>4. Integrating into bigger (wider) systems</th>
<th>1. Foster links and networking.</th>
<th>1. Involvement and representation of rural enterprises in the infrastructure planning process.</th>
</tr>
</thead>
<tbody>
<tr>
<td>5. Meeting required standards, e.g., quality, dimensions</td>
<td>1. Ensure that all infrastructure developments meet the required standards.</td>
<td>1. Keeping up to date with standards; 2. Development of new standards as needed.</td>
</tr>
</tbody>
</table>
Increased farm consumption and increased permanent wealth (permanent asset accumulation due to irrigation). This has significant implications for reducing intrinsic food insecurity in a region.

Reduced food (crop) prices allowing access to food for all, which is more beneficial to landless and subsistence families and provides better nutrition intake. This is also equally beneficial to urban poor and city dwellers, since they spend more than 50 percent of their daily income on food items.

Reduced friction in the rural economy and reduced transaction costs including reduced farm marketing costs due to increased access to farm link roads and to other improved farm and non-farm related services in the region.

Multiple uses of water for bathing, washing, livestock and home gardens.

Increased recharge of groundwater, easy access to groundwater and less drudgery for women in fetching water for daily household needs.

Aesthetic and recreational benefits accrue out of irrigation facilities.

Increased farm income (for farmers) and increased farm and off-farm employment opportunities for rural landless laborers result in better school attendance of children of farm laborers and improved social capital in society. This is due to the income effects of irrigation, since education is still a luxury compared to other basic needs: foods, clothes, shelter, health, etc.

Export tax revenue accruing to government coffers; this is important particularly for the major agricultural (rice) exporting countries like Thailand, Vietnam, USA, etc.

Clearly the above framework of themes and questions would provide direction and content for a research investigation. The challenge will be to hone in on the necessary themes for the project at hand while bearing in mind, as the literature highlights, that smallholder irrigation schemes must be viewed holistically, hence the appropriate themes need to be selected.